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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**NOTICE TO CONTRACTORS
AND
SPECIAL PROVISIONS**

**FOR BUILDING CONSTRUCTION ON STATE HIGHWAY IN
ALAMEDA COUNTY IN SAN LEANDRO AND SAN LORENZO
IN THE SOUTHEAST QUADRANT OF ROUTE 880/238 SEPARATION**

DISTRICT 04, ROUTE 5746

**For Use in Connection with Standard Specifications Dated JULY 1999, Standard Plans Dated JULY 2004, and Labor
Surcharge and Equipment Rental Rates.**

CONTRACT NO. 04-130524

04-Ala-5746

**Bids Open: November 29, 2005
Dated: October 17, 2005**

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IMPORTANT SPECIAL NOTICES

- Attention is directed to "Guarantee" of Section 5 of the special provisions regarding the Contractor's guarantee of contract work.

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Standard Plans List

The Standard Plan sheets applicable to this contract include, but are not limited to those indicated below. Applicable Revised Standard Plans (RSP) and New Standard Plans (NSP) indicated below are included in the project plans as individual Standard Plan sheets.

GENERAL ROAD WORK (Miscellaneous)

A10A	Acronyms and Abbreviations (A-L)
A10B	Acronyms and Abbreviations (M-Z)
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A10D	Symbols (Sheet 2 of 2)
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A20B	Pavement Markers and Traffic Lines, Typical Details
A20D	Pavement Markers and Traffic Lines, Typical Details
A24A	Pavement Markings - Arrows
A24B	Pavement Markings - Arrows
A24C	Pavement Markings – Symbols and Numerals
A24E	Pavement Markings – Words And Crosswalks
A62A	Excavation and Backfill – Miscellaneous Details
A62B	Limits of Payment for Excavation and Backfill – Bridge Surcharge and Wall
A62F	Excavation and Backfill – Metal And Plastic Culverts
A63A	Portable Concrete Barrier (Type 60K)
A63B	Portable Concrete Barrier (Type 60K)
A73B	Markers
A74	Survey Monuments
A77A1	Metal Beam Guard Railing – Standard Railing Section (Wood Post With Wood Block)
A77A2	Metal Beam Guard Railing – Standard Railing Section (Steel Post With Notched Wood or Notched Plastic Block
A77B1	Metal Beam Guard Railing – Standard Hardware
A77C1	Metal Beam Guard Railing – Wood Post and Wood Block Details
A77C2	Metal Beam Guard Railing Steel Post, Notched Wood Block and Notched Plastic Block Details
A77C3	Metal Beam Guard Railing – Typical Line Post Embedment and Hinge Point Offset Details
A77C4	Metal Beam Guard Railing – Typical Railing Delineation and Dike Positioning Details
A77H1	Metal Railing End Anchor Assembly (Type SFT)
A77H3	Metal Railing Anchor Cable and Anchor Plate Details
A77I1	Metal Railing End Anchor Assembly (Type CA)
A77I2	Metal Beam Guard Railing – Buried Post End Anchor
A81A	Crash Cushion, Sand Filled (Unidirectional)
A81B	Crash Cushion, Sand Filled (Unidirectional)
A87A	Curbs and Driveways
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GENERAL ROAD WORK (Drainage)

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D74B	Drainage Inlets
D74C	Drainage Inlets Details
D77A	Grate Details
D77B	Bicycle Proof Grate Details
D78A	Gutter Depressions
D87D	Overside Drains
D88	Construction Loads On Culverts
D97A	Corrugated Metal Pipe Coupling Details No. 1- Annular Coupling Band Bar And Strap and Angle Connections
D97B	Corrugated Metal Pipe Coupling Details No. 2- Hat Band Coupler and Flange Details
D97C	Corrugated Metal Pipe Coupling Details No. 3- Helical and Universal Couplers
D97D	Corrugated Metal Pipe Coupling Details No. 4- Hugger Coupling Bands
D97E	Corrugated Metal Pipe Coupling Details No. 5- Standard Joint
D97F	Corrugated Metal Pipe Coupling Details No. 6- Positive Joint
D97G	Corrugated Metal Pipe Coupling Details No. 7- Positive Joints and Downdrain

GENERAL ROAD WORK (Planting and Irrigation)

H1	Planting and Irrigation – Abbreviations
H2	Planting and Irrigation – Symbols
H3	Planting and Irrigation Details
H4	Planting and Irrigation Details
H5	Planting and Irrigation Details
H6	Planting and Irrigation Details
H7	Planting and Irrigation Details
H8	Planting and Irrigation Details

GENERAL ROAD WORK (Temporary Facilities)

T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
RSP T10A	Traffic Control System for Lane and Complete Closures On Freeways and Expressways
RSP T14	Traffic Control System for Ramp Closure
B0-3	Bridge Details
B2-5	Pile Details-Class 400 And Class 625
B3-7	Retaining Wall Type 5
B3-8	Retaining Wall Details No. 1
B3-9	Retaining Wall Details No. 2
B11-53	Concrete Barrier Type 25

ROADSIDE SIGNS

RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
RS3	Roadside Signs - Laminated Wood Box Post Typical Installation Details No. 3
RS4	Roadside Signs, Typical Installation Details No. 4
S93	Framing Details for Framed Single Sheet Aluminum Signs, Rectangular Shape
S94	Roadside Single Sheet Aluminum Sign, Rectangular Shape
S95	Roadside Single Sheet Aluminum Sign, Diamond Shape

SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

ES-1A	Electrical Systems (Symbols And Abbreviations)
ES-1B	Electrical Systems (Symbols And Abbreviations)

ES-1C	Electrical Systems (Symbols And Abbreviations)
ES-2A	Electrical Systems (Service Equipment)
ES-2C	Electrical Systems (Service Equipment Notes, Type III Series)
ES-2D	Electrical Systems (Service Equipment and Typical Wiring Diagram, Type III – A Series)
ES-3B	Electrical Systems (Controller Cabinet Details)
ES-3C	Electrical Systems (Controller Cabinet Details)
ES-4A	Electrical Systems (Signal Heads And Mountings)
ES-4B	Electrical Systems (Signal Heads And Mountings)
ES-4C	Electrical Systems (Signal Heads And Mountings)
ES-4D	Electrical Systems (Signal Heads And Mountings)
ES-4E	Electrical Systems (Signal Faces And Mountings)
ES-5A	Electrical Systems (Detectors)
ES-5B	Electrical Systems (Detectors)
ES-5D	Electrical Systems (Detectors)
ES-7B	Electrical Systems (Signal And Lighting Standards – Type 1 Standards and Equipment Numbering)
ES-8	Electrical Systems (Pull Box Details)
ES-11	Electrical Systems (Foundation Installations)
ES-13A	Electrical Systems (Splicing Details)
ES-13B	Electrical Systems (Wiring Details and Fuse Ratings)

DEPARTMENT OF TRANSPORTATION

NOTICE TO CONTRACTORS

CONTRACT NO. 04-130524

04-Ala-5746

Sealed proposals for the work shown on the plans entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROJECT PLANS FOR BUILDING
CONSTRUCTION ON STATE HIGHWAY IN ALAMEDA COUNTY IN SAN LEANDRO AND SAN LORENZO IN
THE SOUTHEAST QUADRANT OF ROUTE 880/238 SEPARATION**

will be received at the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, CA 95814, until 2 o'clock p.m. on November 29, 2005, at which time they will be publicly opened and read in Room 0100 at the same address.

Proposal forms for this work are included in a separate book entitled:

**STATE OF CALIFORNIA; DEPARTMENT OF TRANSPORTATION; PROPOSAL AND CONTRACT FOR
BUILDING CONSTRUCTION ON STATE HIGHWAY IN ALAMEDA COUNTY IN SAN LEANDRO AND SAN
LORENZO IN THE SOUTHEAST QUADRANT OF ROUTE 880/238 SEPARATION**

General work description: Construct Maintenance Building

This project has a goal of 3 percent disabled veteran business enterprise (DVBE) participation.

No prebid meeting is scheduled for this project.

Bids are required for the entire work described herein.

At the time this contract is awarded, the Contractor shall possess either a Class A license or Class B license or a combination of Class C licenses which constitutes a majority of the work.

The Contractor must also be properly licensed at the time the bid is submitted, except that on a joint venture bid a joint venture license may be obtained by a combination of licenses after bid opening but before award in conformance with Business and Professions Code, Section 7029.1.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

Preference will be granted to bidders properly certified as a "Small Business" as determined by the Department of General Services, Office of Small Business and Disabled Veteran Business Enterprise Certification (OSDC), at the time of bid opening in conformance with the provisions in Section 2-1.05, "Small Business Preference," of the special provisions, and Section 1896 et seq, Title 2, California Code of Regulations. A form for requesting a "Small Business" preference is included with the bid documents. Applications for status as a "Small Business" must be submitted to the Department of General Services, Office of Small Business and Disabled Veteran Business Enterprise Certification, 707 Third Street, West Sacramento, CA 95605, Telephone Nos. (800) 559-5529 or (916) 375-4940.

A reciprocal preference will be granted to "California company" bidders in conformance with Section 6107 of the Public Contract Code. (See Sections 2 and 3 of the special provisions.) A form for indicating whether bidders are or are not a "California company" is included in the bid documents and is to be filled in and signed by all bidders.

Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.

Contract No. 04-130524

Bidder inquiries may be made as follows:

The Department will consider bidder inquiries only when a completed "Bidder Inquiry" form is submitted. A copy of the "Bidder Inquiry" form is available at the Internet address shown below. The bidder inquiry shall include the bidder's name and telephone number. Submit "Bidder Inquiry" forms to :

Construction Program Duty Senior
111 Grand Avenue
Oakland, CA 94612

Fax Number: (510) 622-1805
E-mail: DUTY_SENIOR_DISTRICT04@dot.ca.gov
Tel. Number: (510) 286-5209

To expedite processing, submittal of "Bidder Inquiry" forms via Fax or E-mail is preferred.

To the extent feasible and at the discretion of the Department, completed "Bidder Inquiry" forms submitted for consideration will be investigated, and responses will be posted on the Internet at:

http://www.dot.ca.gov/hq/esc/oe/project_status/bid_inq.html

The responses to bidders' inquiries, unless incorporated into formal addenda to the contract, are not a part of the contract, and are provided for the bidder's convenience only. In some instances, the question and answer may represent a summary of the matters discussed rather than a word-for-word recitation. The availability or use of information provided in the responses to bidders' inquiries is not to be construed in any way as a waiver of the provisions of Section 2-1.03 of the Standard Specifications or any other provision of the contract, the plans, Standard Specifications or Special Provisions, nor to excuse the contractor from full compliance with those contract requirements. Bidders are cautioned that subsequent responses or contract addenda may affect or vary a response previously given.

Project plans, special provisions, and proposal forms for bidding this project can only be obtained at the Department of Transportation, Plans and Bid Documents, Room 0200, MS #26, Transportation Building, 1120 N Street, Sacramento, California 95814, FAX No. (916) 654-7028, Telephone No. (916) 654-4490. Use FAX orders to expedite orders for project plans, special provisions and proposal forms. FAX orders must include credit card charge number, card expiration date and authorizing signature. Project plans, special provisions, and proposal forms may be seen at the above Department of Transportation office and at the offices of the District Directors of Transportation at Irvine, Oakland, and the district in which the work is situated. Standard Specifications and Standard Plans are available through the State of California, Department of Transportation, Publications Unit, 1900 Royal Oaks Drive, Sacramento, CA 95815, Telephone No. (916) 445-3520.

The successful bidder shall furnish a payment bond and a performance bond.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at the Labor Compliance Office at the offices of the District Director of Transportation for the district in which the work is situated, and available from the California Department of Industrial Relations' Internet Web Site at: <http://www.dir.ca.gov>. Future effective general prevailing wage rates which have been predetermined and are on file with the Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

DEPARTMENT OF TRANSPORTATION

Deputy Director Transportation Engineering

Dated October 17, 2005

AHJ

COPY OF ENGINEER'S ESTIMATE
(NOT TO BE USED FOR BIDDING PURPOSES)

04-130524

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
1	074019	PREPARE STORM WATER POLLUTION PREVENTION PLAN	LS	LUMP SUM
2	074020	WATER POLLUTION CONTROL	LS	LUMP SUM
3	074025	TEMPORARY SOIL STABILIZER	M2	2950
4	074029	TEMPORARY SILT FENCE	M	870
5	074032	TEMPORARY CONCRETE WASHOUT FACILITY	EA	3
6	074033	TEMPORARY CONSTRUCTION ENTRANCE	EA	1
7	074034	TEMPORARY COVER	M2	300
8	074038	TEMPORARY DRAINAGE INLET PROTECTION	EA	13
9	120090	CONSTRUCTION AREA SIGNS	LS	LUMP SUM
10	120100	TRAFFIC CONTROL SYSTEM	LS	LUMP SUM
11	128650	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2
12	129000	TEMPORARY RAILING (TYPE K)	M	37
13	129100	TEMPORARY CRASH CUSHION MODULE	EA	11
14	150305	OBLITERATE SURFACING	M2	200
15	150704	REMOVE YELLOW THERMOPLASTIC TRAFFIC STRIPE	M	120
16	150711	REMOVE PAINTED TRAFFIC STRIPE	M	70
17	150715	REMOVE THERMOPLASTIC PAVEMENT MARKING	M2	78
18	150722	REMOVE PAVEMENT MARKER	EA	18
19	150742	REMOVE ROADSIDE SIGN	EA	7
20	150747	REMOVE ROADSIDE SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	3

Contract No. 04-130524

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
21	150806	REMOVE PIPE	M	32
22	150820	REMOVE INLET	EA	1
23	152381	RELOCATE GATE	EA	2
24	152390	RELOCATE ROADSIDE SIGN	EA	1
25	152430	ADJUST INLET	EA	1
26	153152	COLD PLANE ASPHALT CONCRETE PAVEMENT (30 MM MAXIMUM)	M2	350
27	153214	REMOVE CONCRETE CURB	M	270
28	153216	REMOVE CONCRETE CURB AND SIDEWALK	M3	30
29	153222	REMOVE CONCRETE ISLAND (PORTIONS)	M2	2
30	160101	CLEARING AND GRUBBING	LS	LUMP SUM
31	160120	REMOVE TREE	EA	17
32	035467	ROADWAY EXCAVATION (TYPE R)	M3	3840
33	190105	ROADWAY EXCAVATION (TYPE Z-2) (AERIALY DEPOSITED LEAD)	M3	50
34	190110	LEAD COMPLIANCE PLAN	LS	LUMP SUM
35	192037	STRUCTURE EXCAVATION (RETAINING WALL)	M3	94
36	192053	STRUCTURE EXCAVATION (TYPE Z-2) (AERIALY DEPOSITED LEAD)	M3	38
37	193013	STRUCTURE BACKFILL (RETAINING WALL)	M3	280
38	193031	PERVIOUS BACKFILL MATERIAL (RETAINING WALL)	M3	20
39	198001	IMPORTED BORROW	TONN	7570
40	200001	HIGHWAY PLANTING	LS	LUMP SUM

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
41	203001	EROSION CONTROL (BLANKET)	M2	1050
42	203014	FIBER (EROSION CONTROL)	KG	240
43	203021	FIBER ROLLS	M	23
44	203024	COMPOST (EROSION CONTROL)	M3	3
45	203045	PURE LIVE SEED (EROSION CONTROL)	KG	20
46	203061	STABILIZING EMULSION (EROSION CONTROL)	KG	50
47	204099	PLANT ESTABLISHMENT WORK	LS	LUMP SUM
48	208000	IRRIGATION SYSTEM	LS	LUMP SUM
49	208021	50 MM GALVANIZED STEEL PIPE (SUPPLY LINE)	M	250
50	208024	100 MM GALVANIZED STEEL PIPE (SUPPLY LINE)	M	470
51	208731	200 MM CORRUGATED HIGH DENSITY POLYETHYLENE PIPE CONDUIT	M	14
52	390102	ASPHALT CONCRETE (TYPE A)	TONN	6650
53	394040	PLACE ASPHALT CONCRETE DIKE (TYPE A)	M	420
54	394048	PLACE ASPHALT CONCRETE DIKE (TYPE E)	M	240
55	394049	PLACE ASPHALT CONCRETE DIKE (TYPE F)	M	120
56	491007	FURNISH PILING (CLASS 400)	M	930
57	491008	DRIVE PILE (CLASS 400)	EA	76
58 (F)	510060	STRUCTURAL CONCRETE, RETAINING WALL	M3	98
59 (F)	510502	MINOR CONCRETE (MINOR STRUCTURE)	M3	23
60	510526	MINOR CONCRETE (BACKFILL)	M3	140

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
61 (F)	520103	BAR REINFORCING STEEL (RETAINING WALL)	KG	5050
62	566011	ROADSIDE SIGN - ONE POST	EA	5
63	568001	INSTALL SIGN (STRAP AND SADDLE BRACKET METHOD)	EA	2
64	620904	300 MM ALTERNATIVE PIPE CULVERT	M	76
65	620913	600 MM ALTERNATIVE PIPE CULVERT	M	140
66	620924	900 MM ALTERNATIVE PIPE CULVERT	M	120
67	705339	900 MM ALTERNATIVE FLARED END SECTION	EA	1
68	721010	ROCK SLOPE PROTECTION (BACKING NO. 1, METHOD B)	M3	1
69	729010	ROCK SLOPE PROTECTION FABRIC	M2	10
70	731502	MINOR CONCRETE (MISCELLANEOUS CONSTRUCTION)	M3	47
71 (F)	750001	MISCELLANEOUS IRON AND STEEL	KG	2850
72	800391	CHAIN LINK FENCE (TYPE CL-1.8)	M	300
73	800395	CHAIN LINK FENCE (TYPE CL-1.8, SLATTED)	M	730
74	802595	3.0 M CHAIN LINK GATE (TYPE CL-1.8)	EA	2
75	832003	METAL BEAM GUARD RAILING (WOOD POST)	M	120
76	833126	CONCRETE BARRIER (TYPE 25A)	M	34
77	840501	THERMOPLASTIC TRAFFIC STRIPE	M	1540
78	840515	THERMOPLASTIC PAVEMENT MARKING	M2	89
79	840666	PAINT PAVEMENT MARKING (2-COAT)	M2	13
80	842000	PARKING BUMPER (PRECAST CONCRETE)	EA	9

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity
81	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	66
82	035468	SIGNAL AND LIGHTING (COUNTY)	LS	LUMP SUM
83	861100	RAMP METERING SYSTEM	LS	LUMP SUM
84	035469	GENERAL PACKET RADIO SYSTEM (GPRS) WIRELESS MODEM ASSEMBLY	LS	LUMP SUM
85	869070	POWER AND TELEPHONE SERVICE	LS	LUMP SUM
86	994650	BUILDING WORK	LS	LUMP SUM

**STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION**

SPECIAL PROVISIONS

Annexed to Contract No. 04-130524

SECTION 1. SPECIFICATIONS AND PLANS

The work embraced herein shall conform to the provisions in the Standard Specifications dated July 1999, and the Standard Plans dated July 2004, of the Department of Transportation insofar as the same may apply, and these special provisions.

In case of conflict between the Standard Specifications and these special provisions, the special provisions shall take precedence over and shall be used in lieu of the conflicting portions.

**AMENDMENTS TO JULY 1999 STANDARD
SPECIFICATIONS**

UPDATED JANUARY 28, 2005

Amendments to the Standard Specifications set forth in these special provisions shall be considered as part of the Standard Specifications for the purposes set forth in Section 5-1.04, "Coordination and Interpretation of Plans, Standard Specifications and Special Provisions," of the Standard Specifications. Whenever either the term "Standard Specifications is amended" or the term "Standard Specifications are amended" is used in the special provisions, the text or table following the term shall be considered an amendment to the Standard Specifications. In case of conflict between such amendments and the Standard Specifications, the amendments shall take precedence over and be used in lieu of the conflicting portions.

SECTION 1: DEFINITIONS AND TERMS

Issue Date: January 28, 2005

Section 1-1.265, "Manual of Traffic Controls," of the Standard Specifications is amended to read:

1-1.265 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

- The Manual on Uniform Traffic Control Devices for Streets and Highways, 2003 Edition (MUTCD) is administered by the Federal Highway Administration.

Section 1, "Definitions and Terms," of the Standard Specifications is amended by adding the following section:

1-1.266 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES CALIFORNIA SUPPLEMENT

- The MUTCD 2003 California Supplement (MUTCD California Supplement) is issued by the Department of Transportation to provide amendments to the MUTCD. The MUTCD and MUTCD California Supplement supersede the Department's Manual of Traffic Controls.

SECTION 2: PROPOSAL REQUIREMENTS AND CONDITIONS

Issue Date: June 19, 2003

Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," of the Standard Specifications is amended to read:

2-1.03 Examination of Plans, Specifications, Contract, and Site of Work

- The bidder shall examine carefully the site of the work contemplated, the plans and specifications, and the proposal and contract forms therefor. The submission of a bid shall be conclusive evidence that the bidder has investigated and is satisfied as to the general and local conditions to be encountered, as to the character, quality and scope of work to be performed, the quantities of materials to be furnished and as to the requirements of the proposal, plans, specifications and the contract.

- The submission of a bid shall also be conclusive evidence that the bidder is satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information was reasonably ascertainable from an inspection of the site and the records of exploratory work done by the Department as shown in the bid documents, as well as from the plans and specifications made a part of the contract.

- Where the Department has made investigations of site conditions including subsurface conditions in areas where work is to be performed under the contract, or in other areas, some of which may constitute possible local material sources, bidders or contractors may, upon written request, inspect the records of the Department as to those investigations subject to and upon the conditions hereinafter set forth.

- Where there has been prior construction by the Department or other public agencies within the project limits, records of the prior construction that are currently in the possession of the Department and which have been used by, or are known to, the designers and administrators of the project will be made available for inspection by bidders or contractors, upon written request, subject to the conditions hereinafter set forth. The records may include, but are not limited to, as-built drawings, design calculations, foundation and site studies, project reports and other data assembled in connection with the investigation, design, construction and maintenance of the prior projects.

- Inspection of the records of investigations and project records may be made at the office of the district in which the work is situated, or in the case of records of investigations related to structure work, at the Transportation Laboratory in Sacramento, California.

- When a log of test borings or other record of geotechnical data obtained by the Department's investigation of surface and subsurface conditions is included with the contract plans, it is furnished for the bidders' or Contractor's information and its use shall be subject to the conditions and limitations set forth in this Section 2-1.03.

- In some instances, information considered by the Department to be of possible interest to bidders or contractors has been compiled as "Materials Information." The use of the "Materials Information" shall be subject to the conditions and limitations set forth in this Section 2-1.03 and Section 6-2, "Local Materials."

- When cross sections are not included with the plans, but are available, bidders or contractors may inspect the cross sections and obtain copies for their use, at their expense.

- When cross sections are included with the contract plans, it is expressly understood and agreed that the cross sections do not constitute part of the contract, do not necessarily represent actual site conditions or show location, character, dimensions and details of work to be performed, and are included in the plans only for the convenience of bidders and their use is subject to the conditions and limitations set forth in this Section 2-1.03.

- When contour maps were used in the design of the project, the bidders may inspect those maps, and if available, they may obtain copies for their use.

- The availability or use of information described in this Section 2-1.03 is not to be construed in any way as a waiver of the provisions of the first paragraph in this Section 2-1.03 and bidders and contractors are cautioned to make independent investigations and examinations as they deem necessary to be satisfied as to conditions to be encountered in the performance of the work and, with respect to possible local material sources, the quality and quantity of material available from the property and the type and extent of processing that may be required in order to produce material conforming to the requirements of the specifications.

- The Department assumes no responsibility for conclusions or interpretations made by a bidder or contractor based on the information or data made available by the Department. The Department does not assume responsibility for representation made by its officers or agents before the execution of the contract concerning surface or subsurface conditions, unless that representation is expressly stated in the contract.

- No conclusions or interpretations made by a bidder or contractor from the information and data made available by the Department will relieve a bidder or contractor from properly fulfilling the terms of the contract.

SECTION 5: CONTROL OF WORK

Issue Date: December 31, 2001

Section 5-1.02A, "Trench Excavation Safety Plans," of the Standard Specifications is amended to read:

5-1.02A Excavation Safety Plans

- The Construction Safety Orders of the Division of Occupational Safety and Health shall apply to all excavations. For all excavations 1.5 m or more in depth, the Contractor shall submit to the Engineer a detailed plan showing the design and details of the protective systems to be provided for worker protection from the hazard of caving ground during excavation. The detailed plan shall include any tabulated data and any design calculations used in the preparation of the plan. Excavation shall not begin until the detailed plan has been reviewed and approved by the Engineer.
- Detailed plans of protective systems for which the Construction Safety Orders require design by a registered professional engineer shall be prepared and signed by an engineer who is registered as a Civil Engineer in the State of California, and shall include the soil classification, soil properties, soil design calculations that demonstrate adequate stability of the protective system, and any other design calculations used in the preparation of the plan.
- No plan shall allow the use of a protective system less effective than that required by the Construction Safety Orders.
- If the detailed plan includes designs of protective systems developed only from the allowable configurations and slopes, or Appendices, contained in the Construction Safety Orders, the plan shall be submitted at least 5 days before the Contractor intends to begin excavation. If the detailed plan includes designs of protective systems developed from tabulated data, or designs for which design by a registered professional engineer is required, the plan shall be submitted at least 3 weeks before the Contractor intends to begin excavation.
- Attention is directed to Section 7-1.01E, "Trench Safety."

SECTION 7: LEGAL RELATIONS AND RESPONSIBILITY

Issue Date: January 28, 2005

The eighth paragraph of Section 7-1.09, "Public Safety" of the Standard Specifications is amended to read:

- Signs, lights, flags, and other warning and safety devices and their use shall conform to the requirements set forth in Part 6 of the MUTCD and of the MUTCD California Supplement. Signs or other protective devices furnished and erected by the Contractor, at the Contractor's expense, as above provided, shall not obscure the visibility of, nor conflict in intent, meaning and function of either existing signs, lights and traffic control devices or any construction area signs and traffic control devices for which furnishing of, or payment for, is provided elsewhere in the specifications. Signs furnished and erected by the Contractor, at the Contractor's expense, shall be approved by the Engineer as to size, wording and location.

The fourteenth paragraph of Section 7-1.09, "Public Safety," of the Standard Specifications is amended to read:

- The Contractor shall notify the Engineer not less than 18 days and no more than 90 days prior to the anticipated start of an operation that will change the vertical or horizontal clearance available to public traffic (including shoulders).

The sixteenth paragraph of Section 7-1.09, "Public Safety," of the Standard Specifications is amended to read:

- When vertical clearance is temporarily reduced to 4.72 m or less, low clearance warning signs shall be placed in accordance with Part 2 of the MUTCD and the MUTCD California Supplement, and as directed by the Engineer. Signs shall conform to the dimensions, color, and legend requirements of the MUTCD, the MUTCD California Supplement, and these specifications except that the signs shall have black letters and numbers on an orange retroreflective background. W12-2P signs shall be illuminated so that the signs are clearly visible.

SECTION 9: MEASUREMENT AND PAYMENT

Issue Date: November 17, 2004

Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications is amended to read:

9-1.04 NOTICE OF POTENTIAL CLAIM

- It is the intention of this section that disputes between the parties arising under and by virtue of the contract be brought to the attention of the Engineer at the earliest possible time in order that the matters may be resolved, if possible, or other appropriate action promptly taken.

- Disputes will not be considered unless the Contractor has first complied with specified notice or protest requirements, including Section 4-1.03, "Changes," Section 5-1.116, "Differing Site Conditions," Section 8-1.06, "Time of Completion," Section 8-1.07, "Liquidated Damages," and Section 8-1.10, "Utility and Non-Highway Facilities."

- For disputes arising under and by virtue of the contract, including an act or failure to act by the Engineer, the Contractor shall provide a signed written initial notice of potential claim to the Engineer within 5 days from the date the dispute first arose. The initial notice of potential claim shall provide the nature and circumstances involved in the dispute which shall remain consistent through the dispute. The initial notice of potential claim shall be submitted on Form CEM-6201A furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Contractor shall assign an exclusive identification number for each dispute, determined by chronological sequencing, based on the date of the dispute.

- The exclusive identification number for each dispute shall be used on the following corresponding documents:

- A. Initial notice of potential claim.
- B. Supplemental notice of potential claim.
- C. Full and final documentation of potential claim.
- D. Corresponding claim included in the Contractor's written statement of claims.

- The Contractor shall provide the Engineer the opportunity to examine the site of work within 5 days from the date of the initial notice of potential claim. The Contractor shall proceed with the performance of contract work unless otherwise specified or directed by the Engineer.

- Throughout the disputed work, the Contractor shall maintain records that provide a clear distinction between the incurred direct costs of disputed work and that of undisputed work. The Contractor shall allow the Engineer access to the Contractor's project records deemed necessary by the Engineer to evaluate the potential claim within 20 days of the date of the Engineer's written request.

- Within 15 days of submitting the initial notice of potential claim, the Contractor shall provide a signed supplemental notice of potential claim to the Engineer that provides the following information:

- A. The complete nature and circumstances of the dispute which caused the potential claim.
- B. The contract provisions that provide the basis of claim.
- C. The estimated cost of the potential claim, including an itemized breakdown of individual costs and how the estimate was determined.
- D. A time impact analysis of the project schedule that illustrates the effect on the scheduled completion date due to schedule changes or disruptions where a request for adjustment of contract time is made.

- The information provided in items A and B above shall provide the Contractor's complete reasoning for additional compensation or adjustments.

- The supplemental notice of potential claim shall be submitted on Form CEM-6201B furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655. The Engineer will evaluate the information presented in the supplemental notice of potential claim and provide a written response to the Contractor within 20 days of its receipt. If the estimated cost or effect on the scheduled completion date changes, the Contractor shall update information in items C and D above as soon as the change is recognized and submit this information to the Engineer.

- Within 30 days of the completion of work related to the potential claim, the Contractor shall provide the full and final documentation of potential claim to the Engineer that provides the following information:

- A. A detailed factual narration of events fully describing the nature and circumstances that caused the dispute, including, but not limited to, necessary dates, locations, and items of work affected by the dispute.
- B. The specific provisions of the contract that support the potential claim and a statement of the reasons these provisions support and provide a basis for entitlement of the potential claim.
- C. When additional monetary compensation is requested, the exact amount requested calculated in conformance with Section 9-1.03, "Force Account Payment," or Section 8-1.09, "Right of Way Delays," including an itemized breakdown of individual costs. These costs shall be segregated into the following cost categories:

1. Labor – A listing of individuals, classifications, regular hours and overtime hours worked, dates worked, and other pertinent information related to the requested reimbursement of labor costs.
2. Materials – Invoices, purchase orders, location of materials either stored or incorporated into the work, dates materials were transported to the project or incorporated into the work, and other pertinent information related to the requested reimbursement of material costs.
3. Equipment – Listing of detailed description (make, model, and serial number), hours of use, dates of use and equipment rates. Equipment rates shall be at the applicable State rental rate as listed in the Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates," in effect when the affected work related to the dispute was performed.
4. Other categories as specified by the Contractor or the Engineer.

D. When an adjustment of contract time is requested the following information shall be provided:

1. The specific dates for which contract time is being requested.
2. The specific reasons for entitlement to a contract time adjustment.
3. The specific provisions of the contract that provide the basis for the requested contract time adjustment.
4. A detailed time impact analysis of the project schedule. The time impact analysis shall show the effect of changes or disruptions on the scheduled completion date to demonstrate entitlement to a contract time adjustment.

E. The identification and copies of the Contractor's documents and the substance of oral communications that support the potential claim.

- The full and final documentation of the potential claim shall be submitted on Form CEM-6201C furnished by the Department and shall be certified with reference to the California False Claims Act, Government Code Sections 12650-12655.

- Pertinent information, references, arguments, and data to support the potential claim shall be included in the full and final documentation of potential claim. Information submitted subsequent to the full and final documentation submittal will not be considered. Information required in the full and final documentation of potential claim, as listed in items A to E above, that is not applicable to the dispute may be exempted as determined by the Engineer. No full and final documentation of potential claim will be considered that does not have the same nature and circumstances, and basis of claim as those specified on the initial and supplemental notices of potential claim.

- The Engineer will evaluate the information presented in the full and final documentation of potential claim and provide a written response to the Contractor within 30 days of its receipt unless otherwise specified. The Engineer's receipt of the full and final documentation of potential claim shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand. If the full and final documentation of potential claim is submitted by the Contractor after acceptance of the work by the Director, the Engineer need not provide a written response.

- Provisions in this section shall not apply to those claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate. Administrative disputes are disputes of administrative deductions or retentions, contract item quantities, contract item adjustments, interest payments, protests of contract change orders as provided in Section 4-1.03A, "Procedure and Protest," and protests of the weekly statement of working days as provided in Section 8-1.06, "Time of Completion." Administrative disputes that occur prior to issuance of the proposed final estimate shall follow applicable requirements of this section. Information listed in the supplemental notice and full and final documentation of potential claim that is not applicable to the administrative dispute may be exempted as determined by the Engineer.

- Unless otherwise specified in the special provisions, the Contractor may pursue the administrative claim process pursuant to Section 9-1.07B, "Final Payment and Claims," for any potential claim found by the Engineer to be without merit.

- Failure of the Contractor to conform to specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract, and is deemed as the Contractor's waiver of the potential claim and a waiver of the right to a corresponding claim for the disputed work in the administrative claim process in conformance with Section 9-1.07B, "Final Payment of Claims," and shall operate as a bar to arbitration pursuant to Section 10240.2 of the California Public Contract Code.

Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications is amended to read:

9-1.07B Final Payment and Claims

- After acceptance by the Director, the Engineer will make a proposed final estimate in writing of the total amount payable to the Contractor, including an itemization of the total amount, segregated by contract item quantities, extra work and other bases for payment, and shall also show each deduction made or to be made for prior payments and amounts to be kept

or retained under the provisions of the contract. Prior estimates and payments shall be subject to correction in the proposed final estimate. The Contractor shall submit written approval of the proposed final estimate or a written statement of claims arising under or by virtue of the contract so that the Engineer receives the written approval or statement of claims no later than close of business of the thirtieth day after receiving the proposed final estimate. If the thirtieth day falls on a Saturday, Sunday or legal holiday, then receipt of the written approval or statement of claims by the Engineer shall not be later than close of business of the next business day. The Contractor's receipt of the proposed final estimate shall be evidenced by postal receipt. The Engineer's receipt of the Contractor's written approval or statement of claims shall be evidenced by postal receipt or the Engineer's written receipt if delivered by hand.

- On the Contractor's approval, or if the Contractor files no claim within the specified period of 30 days, the Engineer will issue a final estimate in writing in conformance with the proposed final estimate submitted to the Contractor, and within 30 days thereafter the State will pay the entire sum so found to be due. That final estimate and payment thereon shall be conclusive and binding against both parties to the contract on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- If the Contractor within the specified period of 30 days files claims, the Engineer will issue a semifinal estimate in conformance with the proposed final estimate submitted to the Contractor and within 30 days thereafter the State will pay the sum found to be due. The semifinal estimate and corresponding payment shall be conclusive and binding against both parties to the contract on each question relating to the amount of work done and the compensation payable therefor, except insofar as affected by the claims filed within the time and in the manner required hereunder and except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- Except for claims for overhead costs and administrative disputes that occur after issuance of the proposed final estimate, the Contractor shall only provide the following two items of information for each claim:

- A. The exclusive identification number that corresponds to the supporting full and final documentation of potential claim.
- B. The final amount of requested additional compensation.

- If the final amount of requested additional compensation is different than the amount of requested compensation included in the full and final documentation of potential claim, the Contractor shall provide in the written statement of claims the reasons for the changed amount, the specific provisions of the contract which support the changed amount, and a statement of the reasons the provisions support and provide a basis for the changed amount. If the Contractor's claim fails to provide an exclusive identification number or if there is a disparity in the provided exclusive identification number, the Engineer will notify the Contractor of the omission or disparity. The Contractor shall have 15 days after receiving notification from the Engineer to correct the omission or disparity. If after the 15 days has elapsed, there is still an omission or disparity of the exclusive identification number assigned to the claim, the Engineer will assign the number. No claim will be considered that has any of the following deficiencies:

- A. The claim does not have the same nature, circumstances, and basis as the corresponding full and final documentation of potential claim.
- B. The claim does not have a corresponding full and final documentation of potential claim.
- C. The claim was not included in the written statement of claims.
- D. The Contractor did not comply with applicable notice or protest requirements of Sections 4-1.03, "Changes," 5-1.116, "Differing Site Condition," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," 8-1.10, "Utility and Non-Highway Facilities," and 9-1.04, "Notice of Potential Claim."

- Administrative disputes that occur after issuance of the proposed final estimate shall be included in the Contractor's written statement of claims in sufficient detail to enable the Engineer to ascertain the basis and amounts of those claims.

- The Contractor shall keep full and complete records of the costs and additional time incurred for work for which a claim for additional compensation is made. The Engineer or designated claim investigators or auditors shall have access to those records and any other records as may be required by the Engineer to determine the facts or contentions involved in the claims. Failure to permit access to those records shall be sufficient cause for denying the claims.

- The written statement of claims submitted by the Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code Section 12650 et. seq., the undersigned,

(name)

of

(title)

(company)

hereby certifies that the claim for the additional compensation and time, if any, made herein for the work on this contract is a true statement of the actual costs incurred and time sought, and is fully documented and supported under the contract between parties.

Dated _____

/s/ _____

Subscribed and sworn before me this _____ day

of _____

(Notary Public)

My Commission

Expires _____

- Failure to submit the notarized certificate will be sufficient cause for denying the claim.
- Claims for overhead type expenses or costs, in addition to being certified as stated above, shall be supported and accompanied by an audit report of an independent Certified Public Accountant. Omission of a supporting audit report of an independent Certified Public Accountant shall result in denial of the claim and shall operate as a bar to arbitration, as to the claim, in conformance with the requirements in Section 10240.2 of the California Public Contract Code. Claims for overhead type expenses or costs shall be subject to audit by the State at its discretion. The costs of performing an audit examination and submitting the report shall be borne by the Contractor. The Certified Public Accountant's audit examination shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31. The audit examination and report shall determine if the rates of field and home office overhead are:

- Allowable in conformance with the requirements in Title 48 of the Federal Acquisition Regulations, Chapter 1, Part 31.
- Adequately supported by reliable documentation.
- Related solely to the project under examination.

- Costs or expenses incurred by the State in reviewing or auditing claims that are not supported by the Contractor's cost accounting or other records shall be deemed to be damages incurred by the State within the meaning of the California False Claims Act.

- If the Engineer determines that a claim requires additional analysis, the Engineer will schedule a board of review meeting. The Contractor shall meet with the review board or person and make a presentation in support of the claim. Attendance by the Contractor at the board of review meeting shall be mandatory.

- The District Director of the District that administered the contract will make the final determination of any claims which remain in dispute after completion of claim review by the Engineer or board of review meeting.

The final determination of claims will be sent to the Contractor by hand delivery or deposit in the U.S. mail. The Engineer will then make and issue the Engineer's final estimate in writing and within 30 days thereafter the State will pay the entire sum, if any, found due thereon. That final estimate shall be conclusive and binding against both parties to the contract

on all questions relating to the amount of work done and the compensation payable therefor, except as otherwise provided in Sections 9-1.03C, "Records," and 9-1.09, "Clerical Errors."

- Failure of the Contractor to conform to the specified dispute procedures shall constitute a failure to pursue diligently and exhaust the administrative procedures in the contract and shall operate as a bar to arbitration in conformance with the requirements in Section 10240.2 of the California Public Contract Code.

SECTION 12: CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Issue Date: November 2, 2004

The second paragraph of Section 12-1.01, "Description," of the Standard Specifications is amended to read:

- Attention is directed to Part 6 of the MUTCD and of the MUTCD California Supplement. Nothing in this Section 12 is to be construed as to reduce the minimum standards in these manuals.

Section 12-2.01, "Flaggers," of the Standard Specifications is amended to read:

- Flaggers while on duty and assigned to traffic control or to give warning to the public that the highway is under construction and of any dangerous conditions to be encountered as a result thereof, shall perform their duties and shall be provided with the necessary equipment in conformance with Part 6 of the MUTCD and of the MUTCD California Supplement. The equipment shall be furnished and kept clean and in good repair by the Contractor at the Contractor's expense.

The first paragraph of Section 12-3.01, "General," of the Standard Specifications is amended to read:

- In addition to the requirements in Part 6 of the MUTCD and of the MUTCD California Supplement, all devices used by the Contractor in the performance of the work shall conform to the provisions in this Section 12-3.

The first paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

- The term "Construction Area Signs" shall include all temporary signs required for the direction of public traffic through or around the work during construction. Construction area signs are shown in or referred to in Part 6 of the MUTCD and of the MUTCD California Supplement.

The fourth paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

- All construction area signs shall conform to the dimensions, color and legend requirements of the plans, Part 6 of the MUTCD, Part 6 of the MUTCD California Supplement, and these specifications. All sign panels shall be the product of a commercial sign manufacturer, and shall be as specified in these specifications.

The eighth paragraph of Section 12-3.06, "Construction Area Signs," of the Standard Specifications is amended to read:

- Used signs with the specified sheeting material will be considered satisfactory if they conform to the requirements for visibility and legibility and the colors conform to the requirements in Part 6 of the MUTCD and of the MUTCD California Supplement. A significant difference between day and nighttime retroreflective color will be grounds for rejecting signs.

Section 12-3.06A, "Stationary Mounted Signs," of the Standard Specifications is amended by deleting the third, fourth, fifth, and sixth paragraphs.

SECTION 15: EXISTING HIGHWAY FACILITIES

Issue Date: November 2, 2004

The sixth paragraph of Section 15-2.07, "Payment," of the Standard Specifications is amended to read:

- Full compensation for removing, salvaging, reconstructing, relocating or resetting end caps, return caps, terminal sections, and buried post anchors, for metal beam guard railings and thrie beam barriers, and for connecting reconstructed,

relocated or reset railings and barriers to new and existing facilities, including connections to concrete, shall be considered as included in the contract price paid per meter for the type of railing or barrier work involved and no additional compensation will be allowed therefor.

SECTION 19: EARTHWORK

Issue Date: December 31, 2001

The third paragraph of Section 19-1.02, "Preservation of Property," of the Standard Specifications is amended to read:

- In addition to the provisions in Sections 5-1.02, "Plans and Working Drawings," and 5-1.02A, "Excavation Safety Plans," detailed plans of the protective systems for excavations on or affecting railroad property will be reviewed for adequacy of protection provided for railroad facilities, property, and traffic. These plans shall be submitted at least 9 weeks before the Contractor intends to begin excavation requiring the protective systems. Approval by the Engineer of the detailed plans for the protective systems will be contingent upon the plans being satisfactory to the railroad company involved.

SECTION 42: GROOVE AND GRIND PAVEMENT

Issue Date: December 31, 2001

The last sentence of the first subparagraph of the third paragraph in Section 42-2.02, "Construction," of the Standard Specifications is amended to read:

- After grinding has been completed, the pavement shall conform to the straightedge and profile requirements specified in Section 40-1.10, "Final Finishing."

SECTION 49: PILING

Issue Date: November 2, 2004

The first paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Foundation piles of any material shall be of such length as is required to obtain the specified penetration, and to extend into the cap or footing block as shown on the plans, or specified in the special provisions.

The fourth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- Modification to the specified installation methods and specified pile tip elevation will not be considered at locations where tension or lateral load demands control design pile tip elevations or when the plans state that specified pile tip elevation shall not be revised.

The sixth and seventh paragraphs in Section 49-1.03, "Determination of Length," of the Standard Specifications are amended to read:

- Indicator compression pile load testing shall conform to the requirements in ASTM Designation: D 1143. The pile shall sustain the first compression test load applied which is equal to the nominal resistance in compression, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of compression load testing.
- Indicator tension pile load testing shall conform to the requirements in ASTM Designation: D 3689. The loading apparatus described as "Load Applied to Pile by Hydraulic Jack(s) Acting at One End of Test Beam(s) Anchored to the Pile" shall not be used. The pile shall sustain the first tension test load applied which is equal to the nominal resistance in tension, as shown on the plans, with no more than 13 mm total vertical movement at the top of the pile measured relative to the top of the pile prior to the start of tension load testing.

The ninth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is amended to read:

- For driven piling, the Contractor shall furnish piling of sufficient length to obtain the specified tip elevation shown on the plans or specified in the special provisions. For cast-in-drilled-hole concrete piling, the Contractor shall construct

piling of such length to develop the nominal resistance in compression and to obtain the specified tip elevation shown on the plans or specified in the special provisions.

The tenth paragraph in Section 49-1.03, "Determination of Length," of the Standard Specifications is deleted.

The fourth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

- Load test piles and anchor piles which are not to be incorporated in the completed structure shall be removed in conformance with the provisions in Section 15-4.02, "Removal Methods," and the remaining holes shall be backfilled with earth or other suitable material approved by the Engineer.

The fifth paragraph in Section 49-1.04, "Load Test Piles," of the Standard Specifications is amended to read:

- Load test anchorages in piles used as anchor piles shall conform to the following requirements:
 - A. High strength threaded steel rods shall conform to the provisions for bars in Section 50-1.05, "Prestressing Steel," except Type II bars shall be used.
 - B. High strength steel plates shall conform to the requirements in ASTM Designation: A 709/A 709M, Grade 345.
 - C. Anchor nuts shall conform to the provisions in the second paragraph in Section 50-1.06, "Anchorages and Distribution."

The first paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

- Driven piles shall be installed with impact hammers that are approved in writing by the Engineer. Impact hammers shall be steam, hydraulic, air or diesel hammers. Impact hammers shall develop sufficient energy to drive the piles at a penetration rate of not less than 3 mm per blow at the specified nominal resistance.

The seventh paragraph in Section 49-1.05, "Driving Equipment," of the Standard Specifications is amended to read:

- When necessary to obtain the specified penetration and when authorized by the Engineer, the Contractor may supply and operate one or more water jets and pumps, or furnish the necessary drilling apparatus and drill holes not greater than the least dimension of the pile to the proper depth and drive the piles therein. Jets shall not be used at locations where the stability of embankments or other improvements would be endangered. In addition, for steel piles, steel shells, or steel casings, when necessary to obtain the specified penetration or to prevent damage to the pile during installation, the Contractor shall provide special driving tips or heavier pile sections or take other measures as approved by the Engineer.

- The use of followers or underwater hammers for driving piles will be permitted if authorized in writing by the Engineer. When a follower or underwater hammer is used, its efficiency shall be verified by furnishing the first pile in each bent or footing sufficiently long and driving the pile without the use of a follower or underwater hammer.

The second paragraph in Section 49-1.07, "Driving," of the Standard Specifications is amended to read:

- Timber piles shall be fresh-headed and square and when permitted by the Engineer, the heads of the piles may be protected by means of heavy steel or wrought iron rings. During driving operations timber piling shall be restrained from lateral movement at intervals not to exceed 6 m over the length between the driving head and the ground surface. During driving operations, the timber pile shall be kept moving by continuous operation of the hammer. When the blow count exceeds either 2 times the blow count required in 300 mm, or 3 times the blow count required in 75 mm for the nominal resistance as shown on the plans, computed in conformance with the provisions in Section 49-1.08, "Pile Driving Acceptance Criteria," additional aids shall be used to obtain the specified penetration. These aids may include the use of water jets or drilling, where permitted, or the use of a larger hammer employing a heavy ram striking with a low velocity.

Section 49-1.08, "Bearing Value and Penetration," of the Standard Specifications is amended to read:

49-1.08 PILE DRIVING ACCEPTANCE CRITERIA

- Except for piles to be load tested, driven piles shall be driven to a value of not less than the nominal resistance shown on the plans unless otherwise specified in the special provisions or permitted in writing by the Engineer. In addition, when a pile tip elevation is specified, driven piles shall penetrate at least to the specified tip elevation, unless otherwise permitted in writing by the Engineer. Piles to be load tested shall be driven to the specified tip elevation.

- When the pile nominal resistance is omitted from the plans or the special provisions, timber piles shall be driven to a nominal resistance of 800 kN, and steel and concrete piles shall be driven to a nominal resistance of 1250 kN.
- The nominal resistance for driven piles shall be determined from the following formula in which " R_u " is the nominal resistance in kilonewtons, " E_r " is the manufacturer's rating for joules of energy developed by the hammer at the observed field drop height, and " N " is the number of hammer blows in the last 300 millimeters. (maximum value to be used for N is 100):

$$R_u = (7 * (E_r)^{1/2} * \log_{10} (0.83 * N)) - 550$$

The first paragraph in Section 49-2.03, "Requirements," of the Standard Specifications is amended to read:

- When preservative treatment of timber piles is required by the plans or specified in the special provisions, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and the applicable AWWA Use Category.

The first paragraph in Section 49-2.04, "Treatment of Pile Heads," of the Standard Specifications is amended to read:

- A. An application of wood preservative conforming to the provisions in Section 58-1.04, "Wood Preservative for Manual Treatment," shall first be applied to the head of the pile and a protective cap shall then be built up by applying alternate layers of loosely woven fabric and hot asphalt or tar similar to membrane waterproofing, using 3 layers of asphalt or tar and 2 layers of fabric. The fabric shall measure at least 150 mm more in each direction than the diameter of the pile and shall be turned down over the pile and the edges secured by binding with 2 turns of No. 10 galvanized wire. The fabric shall be wired in advance of the application of the final layer of asphalt or tar, which shall extend down over the wiring.
- B. The sawed surface shall be covered with 3 applications of a hot mixture of 60 percent creosote and 40 percent roofing pitch, or thoroughly brushcoated with 3 applications of hot creosote and covered with hot roofing pitch. A covering of 3.50-mm nominal thickness galvanized steel sheet shall be placed over the coating and bent down over the sides of each pile to shed water.

Section 49-3.01, "Description," of the Standard Specifications is amended by deleting the fifth paragraph.

The sixth and seventh paragraphs in Section 49-3.01, "Description," of the Standard Specifications are amended to read:

- Except for precast prestressed concrete piles in a corrosive environment, lifting anchors used in precast prestressed concrete piles shall be removed, and the holes filled in conformance with the provisions in Section 51-1.18A, "Ordinary Surface Finish."
- Lifting anchors used in precast prestressed concrete piles in a corrosive environment shall be removed to a depth of at least 25 mm below the surface of the concrete, and the resulting hole shall be filled with epoxy adhesive before the piles are delivered to the job site. The epoxy adhesive shall conform to the provisions in Sections 95-1, "General," and 95-2.01, "Binder (Adhesive), Epoxy Resin Base (State Specification 8040-03)."

The first and second paragraphs in Section 49-4.01, "Description," of the Standard Specifications are amended to read:

- Cast-in-place concrete piles shall consist of one of the following:
 - A. Steel shells driven permanently to the required nominal resistance and penetration and filled with concrete.
 - B. Steel casings installed permanently to the required penetration and filled with concrete.
 - C. Drilled holes filled with concrete.
 - D. Rock sockets filled with concrete.
- The drilling of holes shall conform to the provisions in these specifications. Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 25 MPa. At the option of the Contractor, the combined aggregate grading for the concrete shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading. Concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," and Section 51, "Concrete Structures." Reinforcement shall conform to the provisions in Section 52, "Reinforcement."

The fourth paragraph in Section 49-4.03, "Drilled Holes," of the Standard Specifications is amended to read:

- After placing reinforcement and prior to placing concrete in the drilled hole, if caving occurs or deteriorated foundation material accumulates on the bottom of the hole, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

The first and second paragraphs in Section 49-4.04, "Steel Shells," of the Standard Specifications are amended to read:

- Steel shells shall be sufficiently watertight to exclude water during the placing of concrete. The shells may be cylindrical or tapered, step-tapered, or a combination of either, with cylindrical sections.

The first paragraph in Section 49-4.05, "Inspection," of the Standard Specifications is amended to read:

- After being driven and prior to placing reinforcement and concrete therein, the steel shells shall be examined for collapse or reduced diameter at any point. Any shell which is improperly driven or broken or shows partial collapse to such an extent as to materially decrease its nominal resistance will be rejected. Rejected shells shall be removed and replaced, or a new shell shall be driven adjacent to the rejected shell. Rejected shells which cannot be removed shall be filled with concrete by the Contractor at the Contractor's expense. When a new shell is driven to replace a rejected shell, the Contractor, at the Contractor's expense, shall enlarge the footing as determined necessary by the Engineer.

The third paragraph in Section 49-5.01, "Description," of the Standard Specifications is amended to read:

- Steel pipe piles shall conform to the following requirements:
 1. Steel pipe piles less than 360 mm in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 2 or 3.
 2. Steel pipe piles 360 mm and greater in diameter shall conform to the requirements in ASTM Designation: A 252, Grade 3.
 3. Steel pipe piles shall be of the nominal diameter and nominal wall thickness shown on the plans or specified in the special provisions.
 4. The carbon equivalency (CE) of steel for steel pipe piles, as defined in AWS D 1.1, Section XI5.1, shall not exceed 0.45.
 5. The sulfur content of steel for steel pipe piles shall not exceed 0.05-percent.
 6. Seams in steel pipe piles shall be complete penetration welds.

The first paragraph in Section 49-6.01, "Measurement," of the Standard Specifications is amended to read:

- The length of timber, steel, and precast prestressed concrete piles, and of cast-in-place concrete piles consisting of driven shells filled with concrete, shall be the greater of the following:
 - A. The total length in place in the completed work, measured along the longest side, from the tip of the pile to the plane of pile cut-off.
 - B. The length measured along the longest side, from the tip elevation shown on the plans or the tip elevation ordered by the Engineer, to the plane of pile cut-off.

The third paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- The contract price paid per meter for cast-in-drilled-hole concrete piling shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in drilling holes, disposing of material resulting from drilling holes, temporarily casing holes and removing water when necessary, furnishing and placing concrete and reinforcement, and constructing reinforced concrete extensions, complete in place, to the required penetration, as shown on the plans, as specified in these specifications and in the special provisions, and as directed by the Engineer.

The seventh paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read

- The contract unit price paid for drive pile shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in driving timber, concrete and steel piles, driving steel shells for cast-in-place concrete piles, placing filling materials for cast-in-place concrete piles and cutting off piles, all complete in

place to the required nominal resistance and penetration as shown on the plans and as specified in these specifications and the special provisions, and as directed by the Engineer.

The ninth paragraph in Section 49-6.02, "Payment," of the Standard Specifications is amended to read:

- Full compensation for all jetting, drilling, providing special driving tips or heavier sections for steel piles or shells, or other work necessary to obtain the specified penetration and nominal resistance of the piles, for predrilling holes through embankment and filling the space remaining around the pile with sand or pea gravel, for disposing of material resulting from jetting, drilling or predrilling holes, and for all excavation and backfill involved in constructing concrete extensions as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer shall be considered as included in the contract unit price paid for drive pile or in the contract price paid per meter for cast-in-drilled-hole concrete piling, and no additional compensation will be allowed therefor.

Section 49-6.02, "Payment," of the Standard Specifications is amended by adding the following paragraphs:

Full compensation for furnishing and placing additional testing reinforcement, for load test anchorages, and for cutting off test piles, shall be considered as included in the contract price paid for piling of the type or class shown in the Engineer's Estimate, and no additional compensation will be allowed.

No additional compensation or extension of time will be made for additional foundation investigation, installation and testing of indicator piling, cutting off piling and restoring the foundation investigation and indicator pile sites, and review of request by the Engineer

SECTION 50: PRESTRESSING CONCRETE

Issue Date: November 18, 2002

Section 50-1.02, "Drawings," of the Standard Specifications is amended by adding the following paragraph after the second paragraph:

- Each working drawing submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate working drawing submittal.

Section 50-1.05, "Prestressing Steel," of the Standard Specifications is amended to read:

- Prestressing steel shall be high-tensile wire conforming to the requirements in ASTM Designation: A 421, including Supplement I; high-tensile seven-wire strand conforming to the requirements in ASTM Designation: A 416; or uncoated high-strength steel bars conforming to the requirements in ASTM Designation: A 722, including all supplementary requirements. The maximum mass requirement of ASTM Designation: A 722 will not apply.

- In addition to the requirements of ASTM Designation: A 722, for deformed bars, the reduction of area shall be determined from a bar from which the deformations have been removed. The bar shall be machined no more than necessary to remove the deformations over a length of 300 mm, and reduction will be based on the area of the machined portion.

- In addition to the requirements specified herein, epoxy-coated seven-wire prestressing steel strand shall be grit impregnated and filled in conformance with the requirements in ASTM Designation: A 882/A 882M, including Supplement I, and the following:

- A. The coating material shall be on the Department's list of approved coating materials for epoxy-coated strand, available from the Transportation Laboratory.
- B. The film thickness of the coating after curing shall be 381 μm to 1143 μm .
- C. Prior to coating the strand, the Contractor shall furnish to the Transportation Laboratory a representative 230-g sample from each batch of epoxy coating material to be used. Each sample shall be packaged in an airtight container identified with the manufacturer's name and batch number.
- D. Prior to use of the epoxy-coated strand in the work, written certifications referenced in ASTM Designation: A 882/A 882M, including a representative load-elongation curve for each size and grade of strand to be used and a copy of the quality control tests performed by the manufacturer, shall be furnished to the Engineer.
- E. In addition to the requirements in Section 50-1.10, "Samples for Testing," four 1.5-m long samples of coated strand and one 1.5-m long sample of uncoated strand of each size and reel shall be furnished to the Engineer for testing. These samples, as selected by the Engineer, shall be representative of the material to be used in the work.

F. Epoxy-coated strand shall be cut using an abrasive saw.

G. All visible damage to coatings caused by shipping and handling, or during installation, including cut ends, shall be repaired in conformance with the requirements in ASTM Designation: A 882/A 882M. The patching material shall be furnished by the manufacturer of the epoxy powder and shall be applied in conformance with the manufacturer's written recommendations. The patching material shall be compatible with the original epoxy coating material and shall be inert in concrete.

- All bars in any individual member shall be of the same grade, unless otherwise permitted by the Engineer.

- When bars are to be extended by the use of couplers, the assembled units shall have a tensile strength of not less than the manufacturer's minimum guaranteed ultimate tensile strength of the bars. Failure of any one sample to meet this requirement will be cause for rejection of the heat of bars and lot of couplers. The location of couplers in the member shall be subject to approval by the Engineer.

- Wires shall be straightened if necessary to produce equal stress in all wires or wire groups or parallel lay cables that are to be stressed simultaneously or when necessary to ensure proper positioning in the ducts.

- Where wires are to be button-headed, the buttons shall be cold formed symmetrically about the axes of the wires. The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire. No cold forming process shall be used that causes indentations in the wire. Buttonheads shall not contain wide open splits, more than 2 splits per head, or splits not parallel with the axis of the wire.

- Prestressing steel shall be protected against physical damage and rust or other results of corrosion at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. The development of visible rust or other results of corrosion shall be cause for rejection, when ordered by the Engineer.

- Epoxy-coated prestressing steel strand shall be covered with an opaque polyethylene sheeting or other suitable protective material to protect the strand from exposure to sunlight, salt spray, and weather. For stacked coils, the protective covering shall be draped around the perimeter of the stack. The covering shall be adequately secured; however, it should allow for air circulation around the strand to prevent condensation under the covering. Epoxy-coated strand shall not be stored within 300 m of ocean or tidal water for more than 2 months.

- Prestressing steel shall be packaged in containers or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage. Except for epoxy-coated strand, a corrosion inhibitor which prevents rust or other results of corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Engineer, may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.

- The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the type of corrosion inhibitor used, including the date packaged.

- Prestressing steel for post-tensioning which is installed in members prior to placing and curing of the concrete, and which is not epoxy-coated, shall be continuously protected against rust or other results of corrosion, until grouted, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct. The corrosion inhibitor shall conform to the provisions specified herein.

- When steam curing is used, prestressing steel for post-tensioning shall not be installed until the steam curing is completed.

- Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.01-kg/L. Compressed air used to blow out ducts shall be oil free.

- When prestressing steel for post-tensioning is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 days after the installation of the prestressing steel, rust which may form during those 10 days will not be cause for rejection of the steel. Prestressing steel installed, tensioned, and grouted in this manner, all within 10 days, will not require the use of a corrosion inhibitor in the duct following installation of the prestressing steel. Prestressing steel installed as above but not grouted within 10 days shall be subject to all the requirements in this section pertaining to corrosion protection and rejection because of rust. The requirements in this section pertaining to tensioning and grouting within 10 days shall not apply to epoxy-coated prestressing steel strand.

- Any time prestressing steel for pretensioning is placed in the stressing bed and is exposed to the elements for more than 36 hours prior to encasement in concrete, adequate measures shall be taken by the Contractor, as approved by the Engineer, to protect the steel from contamination or corrosion.

- After final fabrication of the seven-wire prestressing steel strand, no electric welding of any form shall be performed on the prestressing steel. Whenever electric welding is performed on or near members containing prestressing steel, the welding ground shall be attached directly to the steel being welded.

- Pretensioned prestressing steel shall be cut off flush with the end of the member. For epoxy-coated prestressing steel, only abrasive saws shall be used to cut the steel. The exposed ends of the prestressing steel and a 25-mm strip of adjoining concrete shall be cleaned and painted. Cleaning shall be by wire brushing or abrasive blast cleaning to remove all

dirt and residue on the metal or concrete surfaces. Immediately after cleaning, the surfaces shall be covered with one application of unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint," except that 2 applications shall be applied to surfaces which will not be covered by concrete or mortar. Aerosol cans shall not be used. The paint shall be thoroughly mixed at the time of application and shall be worked into any voids in the prestressing tendons.

The thirteenth paragraph in Section 50-1.08, "Prestressing," of the Standard Specifications is amended to read:

- Prestressing steel in pretensioned members shall not be cut or released until the concrete in the member has attained a compressive strength of not less than the value shown on the plans or 28 MPa, whichever is greater. In addition to these concrete strength requirements, when epoxy-coated prestressing steel strand is used, the steel shall not be cut or released until the temperature of the concrete surrounding the strand is less than 65°C, and falling.

The fifth paragraph in Section 50-1.10, "Samples for Testing," of the Standard Specifications is amended to read:

- The following samples of materials and tendons, selected by the Engineer from the prestressing steel at the plant or jobsite, shall be furnished by the Contractor to the Engineer well in advance of anticipated use:

- A. For wire or bars, one 2-m long sample and for strand, one 1.5-m long sample, of each size shall be furnished for each heat or reel.
- B. For epoxy-coated strand, one 1.5-m long sample of uncoated strand of each size shall be furnished for each reel.
- C. If the prestressing tendon is a bar, one 2-m long sample shall be furnished and in addition, if couplers are to be used with the bar, two 1.25-m long samples of bar, equipped with one coupler and fabricated to fit the coupler, shall be furnished.

The second paragraph in Section 50-1.11, "Payment," of the Standard Specifications is amended to read:

- The contract lump sum prices paid for prestressing cast-in-place concrete of the types listed in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing, placing, and tensioning the prestressing steel in cast-in-place concrete structures, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

SECTION 51: CONCRETE STRUCTURES

Issue Date: January 28, 2005

The eleventh paragraph in Section 51-1.05, "Forms," of the Standard Specifications is amended to read:

- Form panels for exposed surfaces shall be furnished and placed in uniform widths of not less than 0.9-m and in uniform lengths of not less than 1.8 m, except at the end of continuously formed surfaces where the final panel length required is less than 1.8 m. Where the width of the member formed is less than 0.9-m, the width of the panels shall be not less than the width of the member. Panels shall be arranged in symmetrical patterns conforming to the general lines of the structure. Except when otherwise provided herein or shown on the plans, panels for vertical surfaces shall be placed with the long dimension horizontal and with horizontal joints level and continuous. Form panels for curved surfaces of columns shall be continuous for a minimum of one quarter of the circumference, or 1.8 m. For walls with sloping footings which do not abut other walls, panels may be placed with the long dimension parallel to the footing. Form panels on each side of the panel joint shall be precisely aligned, by means of supports or fasteners common to both panels, to result in a continuous unbroken concrete plane surface. When prefabricated soffit panels are used, form filler panels joining prefabricated panels shall have a uniform minimum width of 0.3-m and shall produce a smooth uniform surface with consistent longitudinal joint lines between the prefabricated panels.

The first and second paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications are amended to read:

- The Contractor shall submit to the Engineer working drawings and design calculations for falsework proposed for use at bridges. For bridges where the height of any portion of the falsework, as measured from the ground line to the soffit of the superstructure, exceeds 4.25 m; or where any individual falsework clear span length exceeds 4.85 m; or where provision for vehicular, pedestrian, or railroad traffic through the falsework is made; the drawings shall be signed by an engineer who is

registered as a Civil Engineer in the State of California. Six sets of the working drawings and 2 copies of the design calculations shall be furnished. Additional working drawings and design calculations shall be submitted to the Engineer when specified in "Railroad Relations and Insurance" of the special provisions.

- The falsework drawings shall include details of the falsework erection and removal operations showing the methods and sequences of erection and removal and the equipment to be used. The details of the falsework erection and removal operations shall demonstrate the stability of all or any portions of the falsework during all stages of the erection and removal operations.

The seventh paragraph in Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended to read:

- In the event that several falsework plans are submitted simultaneously, or an additional plan is submitted for review before the review of a previously submitted plan has been completed, the Contractor shall designate the sequence in which the plans are to be reviewed. In such event, the time to be provided for the review of any plan in the sequence shall be not less than the review time specified above for that plan, plus 2 weeks for each plan of higher priority which is still under review. A falsework plan submittal shall consist of plans for a single bridge or portion thereof. For multi-frame bridges, each frame shall require a separate falsework plan submittal.

Section 51-1.06A, "Falsework Design and Drawings," of the Standard Specifications is amended by adding the following paragraphs:

- If structural composite lumber is proposed for use, the falsework drawings shall clearly identify the structural composite lumber members by grade (E value), species, and type. The Contractor shall provide technical data from the manufacturer showing the tabulated working stress values of the composite lumber. The Contractor shall furnish a certificate of compliance as specified in Section 6-1.07, "Certificates of Compliance," for each delivery of structural composite lumber to the project site.

- For falsework piles with a calculated loading capacity greater than 900 kN, the falsework piles shall be designed by an engineer who is registered as either a Civil Engineer or a Geotechnical Engineer in the State of California, and the calculations shall be submitted to the Engineer.

The first paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- The design load for falsework shall consist of the sum of dead and live vertical loads, and an assumed horizontal load. The minimum total design load for any falsework, including members that support walkways, shall be not less than 4800 N/m² for the combined live and dead load regardless of slab thickness.

The eighth paragraph in Section 51-1.06A(1), "Design Loads," of the Standard Specifications is amended to read:

- In addition to the minimum requirements specified in this Section 51-1.06A, falsework for box girder structures with internal falsework bracing systems using flexible members capable of withstanding tensile forces only, shall be designed to include the vertical effects caused by the elongation of the flexible member and the design horizontal load combined with the dead and live loads imposed by concrete placement for the girder stems and connected bottom slabs. Falsework comprised of individual steel towers with bracing systems using flexible members capable of withstanding tensile forces only to resist overturning, shall be exempt from these additional requirements.

The third paragraph in Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended to read:

- When falsework is supported on piles, the piles shall be driven and the actual nominal resistance assessed in conformance with the provisions in Section 49, "Piling."

Section 51-1.06B, "Falsework Construction," of the Standard Specifications is amended by adding the following paragraphs:

- For falsework piles with a calculated nominal resistance greater than 1800 kN, the Contractor shall conduct dynamic monitoring of pile driving and generate field acceptance criteria based on a wave equation analysis. These analyses shall be signed by an engineer who is registered as a Civil Engineer in the State of California and submitted to the Engineer prior to completion of falsework erection.

- Prior to the placement of falsework members above the stringers, the final bracing system for the falsework shall be installed.

Section 51-1.06C, "Removing Falsework," of the Standard Specifications is amended by adding the following paragraph:

- The falsework removal operation shall be conducted in such a manner that any portion of the falsework not yet removed remains in a stable condition at all times.

The sixth paragraph in Section 51-1.09, "Placing Concrete," of the Standard Specifications is amended to read:

- Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement or epoxy-coated prestressing steel shall have a resilient covering to prevent damage to the epoxy-coating on the reinforcement or prestressing steel.

The third sentence of the fourth paragraph in Section 51-1.12D, "Sheet Packing, Preformed Pads and Board Fillers," of the Standard Specifications is amended to read:

Surfaces of expanded polystyrene against which concrete is placed shall be faced with hardboard.

Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended by adding the following paragraph:

- The opening of the joints at the time of placing shall be that shown on the plans adjusted for temperature. Care shall be taken to avoid impairment of the clearance in any manner.

The first paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- Where shown on the plans, joints in structures shall be sealed with joint seals, joint seal assemblies, or seismic joints in conformance with the details shown on the plans, the provisions in these specifications, and the special provisions.

The fourth paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- Joint seal assemblies and seismic joints shall consist of metal or metal and elastomeric assemblies which are anchored or cast into a recess in the concrete over the joint. Strip seal joint seal assemblies consist of only one joint cell. Modular unit joint seal assemblies consist of more than one joint cell.

The fifth paragraph in Section 51-1.12F, "Sealed Joints," of the Standard Specifications is amended to read:

- The Movement Rating (MR) shall be measured normal to the longitudinal axis of the joint. The type of seal to be used for the MR shown on the plans shall be as follows:

Movement Rating (MR)	Seal Type
MR ≤ 15 mm	Type A or Type B
15 mm < MR ≤ 30 mm	Type A (silicone only) or Type B
30 mm < MR ≤ 50 mm	Type B
50 mm < MR ≤ 100 mm	Joint Seal Assembly (Strip Seal)
MR > 100 mm	Joint Seal Assembly (Modular Unit) or Seismic Joint

The second paragraph in Section 51-1.12F(3)(b), "Type B Seal," of the Standard Specifications is amended to read:

- The preformed elastomeric joint seal shall conform to the requirements in ASTM Designation: D 2628 and the following:
 - A. The seal shall consist of a multi-channel, nonporous, homogeneous material furnished in a finished extruded form.
 - B. The minimum depth of the seal, measured at the contact surface, shall be at least 95 percent of the minimum uncompressed width of the seal as designated by the manufacturer.
 - C. When tested in conformance with the requirements in California Test 673 for Type B seals, joint seals shall provide a Movement Rating (MR) of not less than that shown on the plans.

- D. The top and bottom edges of the joint seal shall maintain continuous contact with the sides of the groove over the entire range of joint movement.
- E. The seal shall be furnished full length for each joint with no more than one shop splice in any 18-m length of seal.
- F. The Contractor shall demonstrate the adequacy of the procedures to be used in the work before installing seals in the joints.
- G. Shop splices and field splices shall have no visible offset of exterior surfaces, and shall show no evidence of bond failure.
- H. At all open ends of the seal that would admit water or debris, each cell shall be filled to a depth of 80 mm with commercial quality open cell polyurethane foam, or closed by other means subject to approval by the Engineer.

Section 51-1.12F(3)(c), "Joint Seal Assemblies," of the Standard Specifications is amended to read:

(c) Joint Seal Assemblies and Seismic Joints

- Joint seal assemblies and seismic joints shall be furnished and installed in joints in bridge decks as shown on the plans and as specified in the special provisions.

The eighth paragraph in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

- The elastomer, as determined from test specimens, shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	15.5 Min.
Elongation at break, percent	D 412	350 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	25 Max.
Tear strength, kN/m	D 624 (Die C)	31.5 Min.
Hardness (Type A)	D 2240 with 2 kg. mass	55 ±5
Ozone resistance 20% strain, 100 h at 40°C ±2°C	D 1149 (except 100 ±20 parts per 100 000 000)	No cracks
Instantaneous thermal stiffening at -40°C	D 1043	Shall not exceed 4 times the stiffness measured at 23°C
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass

The table in the ninth paragraph of Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads," of the Standard Specifications is amended to read:

Tensile strength, percent	-15
Elongation at break, percent	-40; but not less than 300% total elongation of the material
Hardness, points	+10

The first paragraph in Section 51-1.12H(2), "Steel Reinforced Elastomeric Bearings," of the Standard Specifications is amended to read:

- Steel reinforced elastomeric bearings shall conform to the requirements for steel-laminated elastomeric bearings in ASTM Designation: D 4014 and the following:
 - A. The bearings shall consist of alternating steel laminates and internal elastomer laminates with top and bottom elastomer covers. Steel laminates shall have a nominal thickness of 1.9 mm (14 gage). Internal elastomer laminates shall have a thickness of 12 mm, and top and bottom elastomer covers shall each have a thickness of 6 mm. The combined thickness of internal elastomer laminates and top and bottom elastomer covers shall be equal to the bearing pad thickness shown on the plans. The elastomer cover to the steel laminates at the sides of the bearing shall be 3 mm. If guide pins or other devices are used to control the side cover over the steel laminates, any exposed

portions of the steel laminates shall be sealed by vulcanized patching. The length, width, or diameter of the bearings shall be as shown on the plans.

- B. The total thickness of the bearings shall be equal to the thickness of elastomer laminates and covers plus the thickness of the steel laminates.
- C. Elastomer for steel reinforced elastomeric bearings shall conform to the provisions for elastomer in Section 51-1.12H(1), "Plain and Fabric Reinforced Elastomeric Bearing Pads."
- D. A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer certifying that the bearings to be furnished conform to all of the above provisions. The Certificate of Compliance shall be supported by a certified copy of the results of tests performed by the manufacturer on the bearings.
- E. One sample bearing shall be furnished to the Engineer from each lot of bearings to be furnished for the contract. Samples shall be available at least 3 weeks in advance of intended use. The sample bearing shall be one of the following:

Bearing Pad Thickness as Shown on the Plans	Sample Bearing
≤ 50 mm	Smallest complete bearing shown on the plans
> 50 mm	* 57 ± 3 mm thick sample not less than 200 mm x 305 mm in plan and cut by the manufacturer from the center of one of the thickest complete bearings

* The sample bearing plus remnant parts of the complete bearing shall be furnished to the Engineer.

- F. A test specimen taken from the sample furnished to the Engineer will be tested in conformance with the requirements in California Test 663. Specimens tested shall show no indication of loss of bond between the elastomer and steel laminates.

The fourth paragraph in Section 51-1.14, "Waterstops," of the Standard Specifications is amended to read:

- Neoprene shall be manufactured from a vulcanized elastomeric compound containing neoprene as the sole elastomer and shall conform to the following:

Test	ASTM Designation	Requirement
Tensile strength, MPa	D 412	13.8 Min.
Elongation at break, percent	D 412	300 Min.
Compression set, 22 h at 70°C, percent	D 395 (Method B)	30 Max.
Tear strength, kN/m	D 624 (Die C)	26.3 Min.
Hardness (Type A)	D 2240	55±5
Ozone resistance 20% strain, 100 h at 38°C ±1°C	D 1149 (except 100±20 parts per 100 000 000)	No cracks
Low temperature brittleness at -40°C	D 746 (Procedure B)	Pass
Flame resistance	C 542	Must not propagate flame
Oil Swell, ASTM Oil #3, 70 h at 100°C, volume change, percent	D 471	80 Max.
Water absorption, immersed 7 days at 70°C, change in mass, percent	D 471	15 Max.

The first sentence of the fourth paragraph in Section 51-1.17, "Finish Bridge Decks," of the Standard Specifications is amended to read:

- The smoothness of completed roadway surfaces of structures, approach slabs and the adjacent 15 m of approach pavement, and the top surfaces of concrete decks which are to be covered with another material, will be tested by the

Engineer with a bridge profilograph in conformance with the requirements in California Test 547 and the requirements herein.

Section 51-1.17, "Finishing Bridge Decks," of the Standard Specifications is amended by deleting the seventh, thirteenth and fourteenth paragraphs.

The fourteenth paragraph in Section 51-1.23, "Payment," of the Standard Specifications is amended by deleting "and injecting epoxy in cracks".

SECTION 52: REINFORCEMENT

Issue Date: November 2, 2004

The first paragraph in Section 52-1.02A, "Bar Reinforcement," of the Standard Specifications is amended to read:

• Reinforcing bars shall be low-alloy steel deformed bars conforming to the requirements in ASTM Designation: A 706/A 706M, except that deformed or plain billet-steel bars conforming to the requirements in ASTM Designation: A 615/A 615M, Grade 280 or 420, may be used as reinforcement in the following 5 categories:

- A. Slope and channel paving,
- B. Minor structures,
- C. Sign and signal foundations (pile and spread footing types),
- D. Roadside rest facilities, and
- E. Concrete barrier Type 50 and Type 60 series and temporary railing.

The third paragraph in Section 52-1.04, "Inspection," of the Standard Specifications is amended to read:

• A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall also be furnished for each shipment of epoxy-coated bar reinforcement or wire reinforcement certifying that the coated reinforcement conforms to the requirements in ASTM Designation: A 775/A 775M or A 884/A 884M respectively, and the provisions in Section 52-1.02B, "Epoxy-coated Reinforcement." The Certificate of Compliance shall include all of the certifications specified in ASTM Designation: A 775/A 775M or A 884/A 884M respectively.

Section 52-1.07 "Placing," of the Standard Specifications is amended by deleting item C of the third paragraph.

The eleventh paragraph in Section 52-1.07, "Placing," of the Standard Specifications is amended to read:

• Attention is directed to the provisions in Section 7-1.09, "Public Safety." Whenever a portion of an assemblage of bar reinforcing steel that is not encased in concrete exceeds 6 m in height, the Contractor shall submit to the Engineer for approval, in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," working drawings and design calculations for the temporary support system to be used. The working drawings and design calculations shall be signed by an engineer who is registered as a Civil Engineer in the State of California. The temporary support system shall be designed to resist all expected loads and shall be adequate to prevent collapse or overturning of the assemblage. If the installation of forms or other work requires revisions to or temporary release of any portion of the temporary support system, the working drawings shall show the support system to be used during each phase of construction. The minimum horizontal wind load to be applied to the bar reinforcing steel assemblage, or to a combined assemblage of reinforcing steel and forms, shall be the sum of the products of the wind impact area and the applicable wind pressure value for each height zone. The wind impact area is the total projected area of the cage normal to the direction of the applied wind. Wind pressure values shall be determined from the following table:

Height Zone (Meters above ground)	Wind Pressure Value (Pa)
0-9.0	960
9.1-15.0	1200
15.1-30.0	1440
Over 30	1675

Section 52-1.08 "Splicing," of the Standard Specifications is amended to read:

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52-1.08 SPLICING

- Splices of reinforcing bars shall consist of lap splices, service splices, or ultimate butt splices.
- Splicing of reinforcing bars will not be permitted at a location designated on the plans as a "No-Splice Zone." At the option of the Contractor, reinforcing bars may be continuous at locations where splices are shown on the plans. The location of splices, except where shown on the plans, shall be determined by the Contractor using available commercial lengths where practicable.
- Unless otherwise shown on the plans, splices in adjacent reinforcing bars at any particular section shall be staggered. The minimum distance between staggered lap splices or mechanical lap splices shall be the same as the length required for a lap splice in the largest bar. The minimum distance between staggered butt splices shall be 600 mm, measured between the midpoints of the splices along a line which is centered between the axes of the adjacent bars.

52-1.08A Lap Splicing Requirements

- Splices made by lapping shall consist of placing reinforcing bars in contact and wiring them together, maintaining the alignment of the bars and the minimum clearances. Should the Contractor elect to use a butt welded or mechanical splice at a location not designated on the plans as requiring a service or ultimate butt splice, this splice shall conform to the testing requirements for service splice.
- Reinforcing bars shall not be spliced by lapping at locations where the concrete section is not sufficient to provide a minimum clear distance of 50 mm between the splice and the nearest adjacent bar. The clearance to the surface of the concrete specified in Section 52-1.07, "Placing," shall not be reduced.
- Reinforcing bars Nos. 43 and 57 shall not be spliced by lapping.
- Where ASTM Designations: A 615/A 615M, Grade 420 or A 706/A 706M reinforcing bars are required, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 45 diameters of the smaller bar joined; and reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 60 diameters of the smaller bar joined, except when otherwise shown on the plans.
- Where ASTM Designation: A 615/A 615M, Grade 280 reinforcing bars are permitted, the length of lap splices shall be as follows: Reinforcing bars No. 25 or smaller shall be lapped at least 30 diameters of the smaller bar joined; and reinforcing bars Nos. 29, 32, and 36 shall be lapped at least 45 diameters of the smaller bar joined, except when otherwise shown on the plans.
- Splices in bundled bars shall conform to the following:
 - A. In bundles of 2 bars, the length of the lap splice shall be the same as the length of a single bar lap splice.
 - B. In bundles of 3 bars, the length of the lap splice shall be 1.2 times the length of a single bar lap splice.
- Welded wire fabric shall be lapped such that the overlap between the outermost cross wires is not less than the larger of:
 - A. 150 mm,
 - B. The spacing of the cross wires plus 50 mm, or
 - C. The numerical value of the longitudinal wire size (MW-Size Number) times 370 divided by the spacing of the longitudinal wires in millimeters.

52-1.08B Service Splicing and Ultimate Butt Splicing Requirements

- Service splices and ultimate butt splices shall be either butt welded or mechanical splices, shall be used at the locations shown on the plans, and shall conform to the requirements of these specifications and the special provisions.

52-1.08B(1) Mechanical Splices

- Mechanical splices to be used in the work shall be on the Department's current prequalified list before use. The prequalified list can be obtained from the Department's internet site listed in the special provisions or by contacting the Transportation Laboratory directly.
- When tested in conformance with the requirements in California Test 670, the total slip shall not exceed the values listed in the following table:

Reinforcing Bar Number	Total Slip (μm)
13	250
16	250
19	250
22	350
25	350
29	350
32	450
36	450
43	600
57	750

- Slip requirements shall not apply to mechanical lap splices, splices that are welded, or splices that are used on hoops.
- Splicing procedures shall be in conformance with the manufacturer's recommendations, except as modified in this section. Splices shall be made using the manufacturer's standard equipment, jigs, clamps, and other required accessories.
- Splice devices shall have a clear coverage of not less than 40 mm measured from the surface of the concrete to the outside of the splice device. Stirrups, ties, and other reinforcement shall be adjusted or relocated, and additional reinforcement shall be placed, if necessary, to provide the specified clear coverage to reinforcement.
- The Contractor shall furnish the following information for each shipment of splice material in conformance with the provisions in Section 6-1.07, "Certificates of Compliance:"

- A. The type or series identification of the splice material including tracking information for traceability.
- B. The bar grade and size number to be spliced.
- C. A copy of the manufacturer's product literature giving complete data on the splice material and installation procedures.
- D. A statement that the splicing systems and materials used in conformance with the manufacturer's installation procedures will develop the required tensile strengths, based on the nominal bar area, and will conform to the total slip requirements and the other requirements in these specifications.
- E. A statement that the splice material conforms to the type of mechanical splice in the Department's current prequalified list.

52-1.08B(2) Butt Welded Splices

- Except for resistance butt welds, butt welded splices of reinforcing bars shall be complete joint penetration butt welds conforming to the requirements in AWS D 1.4, and these specifications.
- Welders and welding procedures shall be qualified in conformance with the requirements in AWS D 1.4.
- Only the joint details and dimensions as shown in Figure 3.2, "Direct Butt Joints," of AWS D 1.4, shall be used for making complete joint penetration butt welds of bar reinforcement. Split pipe backing shall not be used.
- Butt welds shall be made with multiple weld passes using a stringer bead without an appreciable weaving motion. The maximum stringer bead width shall be 2.5 times the diameter of the electrode and slagging shall be performed between each weld pass. Weld reinforcement shall not exceed 4 mm in convexity.
- Electrodes used for welding shall meet the minimum Charpy V-notch impact requirement of 27°J at –20°C.
- For welding of bars conforming to the requirements of ASTM Designation: A 615/A 615M, Grade 280 or Grade 420, the requirements of Table 5.2, "Minimum Preheat and Interpass Temperatures," of AWS D 1.4 are superseded by the following:

The minimum preheat and interpass temperatures shall be 200°C for Grade 280 bars and 300°C for Grade 420 bars. Immediately after completing the welding, at least 150 mm of the bar on each side of the splice shall be covered by an insulated wrapping to control the rate of cooling. The insulated wrapping shall remain in place until the bar has cooled below 90°C.

- When welding different grades of reinforcing bars, the electrode shall conform to Grade 280 bar requirements and the preheat shall conform to the Grade 420 bar requirements.
- In the event that any of the specified preheat, interpass, and post weld cooling temperatures are not met, all weld and heat affected zone metal shall be removed and the splice rewelded.
- Welding shall be protected from air currents, drafts, and precipitation to prevent loss of heat or loss of arc shielding. The method of protecting the welding area from loss of heat or loss of arc shielding shall be subject to approval by the Engineer.

- Reinforcing bars shall not be direct butt spliced by thermite welding.
- Procedures to be used in making welded splices in reinforcing bars, and welders employed to make splices in reinforcing bars, shall be qualified by tests performed by the Contractor on sample splices of the type to be used, before making splices to be used in the work.

52-1.08B(3) Resistance Butt Welds

- Shop produced resistance butt welds shall be produced by a fabricator who is approved by the Transportation Laboratory. The list of approved fabricators can be obtained from the Department's internet site or by contacting the Transportation Laboratory directly.
- Before manufacturing hoops using resistance butt welding, the Contractor shall submit to the Engineer the manufacturer's Quality Control (QC) manual for the fabrication of hoops. As a minimum, the QC manual shall include the following:
 - A. The pre-production procedures for the qualification of material and equipment.
 - B. The methods and frequencies for performing QC procedures during production.
 - C. The calibration procedures and calibration frequency for all equipment.
 - D. The welding procedure specification (WPS) for resistance welding.
 - E. The method for identifying and tracking lots.

52-1.08C Service Splice and Ultimate Butt Splice Testing Requirements

- The Contractor shall designate in writing a splicing Quality Control Manager (QCM). The QCM shall be responsible directly to the Contractor for 1) the quality of all service and ultimate butt splicing including the inspection of materials and workmanship performed by the Contractor and all subcontractors; and 2) submitting, receiving, and approving all correspondence, required submittals, and reports regarding service and ultimate splicing to and from the Engineer.
- The QCM shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.
- Testing on prequalification and production sample splices shall be performed at the Contractor's expense, at an independent qualified testing laboratory. The laboratory shall not be employed or compensated by any subcontractor, or by other persons or entities hired by subcontractors who will provide other services or materials for the project, and shall have the following:
 - A. Proper facilities, including a tensile testing machine capable of breaking the largest size of reinforcing bar to be tested with minimum lengths as shown in this section.
 - B. A device for measuring the total slip of the reinforcing bars across the splice to the nearest 25 μm , that, when placed parallel to the longitudinal axis of the bar is able to simultaneously measure movement across the splice at 2 locations 180 degrees apart.
 - C. Operators who have received formal training for performing the testing requirements of ASTM Designation: A 370 and California Test 670.
 - D. A record of annual calibration of testing equipment performed by an independent third party that has 1) standards that are traceable to the National Institute of Standards and Technology, and 2) a formal reporting procedure, including published test forms.
- The Contractor shall provide samples for quality assurance testing in conformance with the provisions in these specifications and the special provisions.
 - Prequalification and production sample splices shall be 1) a minimum length of 1.5 meters for reinforcing bars No. 25 or smaller, and 2 meters for reinforcing bars No. 29 or larger, with the splice located at mid-point; and 2) suitably identified before shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. Splices that show signs of tampering will be rejected.
 - Shorter length sample splice bars may be furnished if approved in writing by the Engineer.
 - The Contractor shall ensure that sample splices are properly secured and transported to the testing laboratory in such a manner that no alterations to the physical conditions occur during transportation. Sample splices shall be tested in the same condition as received. No modifications to the sample splices shall be made before testing.
 - Each set or sample splice, as defined herein, shall be identified as representing either a prequalification or production test sample splice.
 - For the purpose of production testing, a lot of either service splices or ultimate butt splices is defined as 1) 150, or fraction thereof, of the same type of mechanical splices used for each bar size and each bar deformation pattern that is used in the work, or 2) 150, or fraction thereof, of complete joint penetration butt welded splices or resistance butt welded splices for

each bar size used in the work. If different diameters of hoop reinforcement are shown on the plans, separate lots shall be used for each different hoop diameter.

- Whenever a lot of splices is rejected, the rejected lot and subsequent lots of splices shall not be used in the work until 1) the QCM performs a complete review of the Contractor's quality control process for these splices, 2) a written report is submitted to the Engineer describing the cause of failure for the splices in this lot and provisions for preventing similar failures in future lots, and 3) the Engineer has provided the Contractor with written notification that the report is acceptable. The Engineer shall have 3 working days after receipt of the report to provide notification to the Contractor. In the event the Engineer fails to provide notification within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in providing notification, the Contractor will be compensated for any resulting loss, and an extension of time will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

52-1.08C(1) Splice Prequalification Report

- Before using any service splices or ultimate butt splices in the work, the Contractor shall submit a Splice Prequalification Report. The report shall include splice material information, names of the operators who will be performing the splicing, and descriptions of the positions, locations, equipment, and procedures that will be used in the work.

- The Splice Prequalification Report shall also include certifications from the fabricator for prequalifications of operators and procedures based on sample tests performed no more than 2 years before submitting the report. Each operator shall be certified by performing 2 sample splices for each bar size of each splice type that the operator will be performing in the work. For deformation-dependent types of splice devices, each operator shall be certified by performing 2 additional samples for each bar size and deformation pattern that will be used in the work.

- Prequalification sample splices shall be tested by an independent qualified testing laboratory and shall conform to the appropriate production test criteria and slip requirements specified herein. When epoxy-coated reinforcement is required, resistance butt welded sample splices shall have the weld flash removed by the same procedure as will be used in the work, before coating and testing. The Splice Prequalification Report shall include the certified test results for all prequalification sample splices.

- The QCM shall review and approve the Splice Prequalification Report before submitting it to the Engineer for approval. The Contractor shall allow 2 weeks for the review and approval of a complete report before performing any service splicing or ultimate butt splicing in the work. In the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

52-1.08C(2) Service Splice Test Criteria

- Service production and quality assurance sample splices shall be tensile tested in conformance with the requirements in ASTM Designation: A 370 and California Test 670 and shall develop a minimum tensile strength of not less than 550 MPa.

52-1.08C(2)(a) Production Test Requirements for Service Splices

- Production tests shall be performed by the Contractor's independent laboratory for all service splices used in the work. A production test shall consist of testing 4 sample splices prepared for each lot of completed splices. The samples shall be prepared by the Contractor using the same splice material, position, operators, location, and equipment, and following the same procedure as used in the work.

- At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.

- The 4 samples from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 samples of splices shall not be tested.

- Before performing any tensile tests on production test sample splices, one of the 4 samples shall be tested for, and shall conform to, the requirements for total slip. Should this sample not meet the total slip requirements, one retest, in which the 3 remaining samples are tested for total slip, will be allowed. Should any of the 3 remaining samples not conform to the total slip requirements, all splices in the lot represented by this production test will be rejected.

- If 3 or more sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable, provided each of the 4 samples develop a minimum tensile strength of not less than 420 MPa.

- Should only 2 sample splices from a production test conform to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," one additional production test shall be performed on the same lot of splices. This additional production test shall consist of testing 4 sample splices that have been randomly selected by the Engineer and removed by the

Contractor from the actual completed lot of splices. Should any of the 4 splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.

- If only one sample splice from a production test conforms to the provisions in this Section 52-1.08C(2), "Service Splice Test Criteria," all splices in the lot represented by this production test will be rejected.
- If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed before the Engineer selects additional splices from this lot for further testing.

52-1.08C(2)(b) Quality Assurance Test Requirements for Service Splices

- For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional service quality assurance sample splices. These service quality assurance sample splices shall be prepared in the same manner as specified herein for service production sample splices.
- These 4 additional quality assurance sample splices shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sample splices shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 samples of splices will not be tested. Sample splices not accompanied by the supporting documentation required in Section 52-1.08B(1), for mechanical splices, or in Section 52-1.08B(3), for resistance butt welds, will not be tested.
- Quality assurance testing will be performed in conformance with the requirements for service production sample splices in Section 52-1.08C(2)(a), "Production Test Requirements for Service Splices."

52-1.08C(3) Ultimate Butt Splice Test Criteria

- Ultimate production and quality assurance sample splices shall be tensile tested in conformance with the requirements described in ASTM Designation: A 370 and California Test 670.
- A minimum of one control bar shall be removed from the same bar as, and adjacent to, all ultimate production, and quality assurance sample splices. Control bars shall be 1) a minimum length of one meter for reinforcing bars No. 25 or smaller and 1.5 meters for reinforcing bars No. 29 or larger, and 2) suitably identified before shipment with weatherproof markings that do not interfere with the Engineer's tamper-proof markings or seals. The portion of adjacent bar remaining in the work shall also be identified with weatherproof markings that correspond to its adjacent control bar.
- Each sample splice and its associated control bar shall be identified and marked as a set. Each set shall be identified as representing a prequalification, production, or quality assurance sample splice.
- The portion of hoop reinforcing bar, removed to obtain a sample splice and control bar, shall be replaced using a prequalified ultimate mechanical butt splice, or the hoop shall be replaced in kind.
- Reinforcing bars, other than hoops, from which sample splices are removed, shall be repaired using ultimate mechanical butt splices conforming to the provisions in Section 52-1.08C(1), "Splice Prequalification Report," or the bars shall be replaced in kind. These bars shall be repaired or replaced such that no splices are located in any "No Splice Zone" shown on the plans.
- Ultimate production and quality assurance sample splices shall rupture in the reinforcing bar either: 1) outside of the affected zone or 2) within the affected zone, provided that the sample splice has achieved at least 95 percent of the ultimate tensile strength of the control bar associated with the sample splice. In addition, necking of the bar, as defined in California Test 670, shall be evident at rupture regardless of whether the bar breaks inside or outside the affected zone.
- The affected zone is the portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been altered by fabrication or installation of the splice.
- The ultimate tensile strength shall be determined for all control bars by tensile testing the bars to rupture, regardless of where each sample splice ruptures. If 2 control bars are tested for one sample splice, the bar with the lower ultimate tensile strength shall be considered the control bar.

52-1.08C(3)(a) Production Test Requirements for Ultimate Butt Splices

- Production tests shall be performed for all ultimate butt splices used in the work. A production test shall consist of testing 4 sets of sample splices and control bars removed from each lot of completed splices, except when quality assurance tests are performed.
- After the splices in a lot have been completed, and the bars have been epoxy-coated when required, the QCM shall notify the Engineer in writing that the splices in this lot conform to the specifications and are ready for testing. Except for hoops, sample splices will be selected by the Engineer at the job site. Sample splices for hoops will be selected by the Engineer either at the job site or a fabrication facility.
- After notification has been received, the Engineer will randomly select the 4 sample splices to be removed from the lot and place tamper-proof markings or seals on them. The Contractor shall select the adjacent control bar for each sample splice bar, and the Engineer will place tamper-proof markings or seals on them. These ultimate production sample splices and control bars shall be removed by the Contractor, and tested by an independent qualified testing laboratory.

- At least one week before testing, the Contractor shall notify the Engineer in writing of the date when and the location where the testing of the samples will be performed.
- A sample splice or control bar from any set will be rejected if a tamper-proof marking or seal is disturbed before testing.
- The 4 sets from each production test shall be securely bundled together and identified with a completed sample identification card before shipment to the independent laboratory. The card will be furnished by the Engineer. Bundles of samples containing fewer than 4 sets of splices shall not be tested.
- Before performing any tensile tests on production test sample splices, one of the 4 sample splices shall be tested for, and shall conform to, the requirements for total slip. Should this sample splice not meet these requirements, one retest, in which the 3 remaining sample splices are tested for total slip, will be allowed. Should any of the 3 remaining sample splices not conform to these requirements, all splices in the lot represented by this production test will be rejected.
- If 3 or more sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be considered acceptable.
- Should only 2 sample splices from a production test conform to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," one additional production test shall be performed on the same lot of splices. Should any of the 4 sample splices from this additional test fail to conform to these provisions, all splices in the lot represented by these production tests will be rejected.
- If only one sample splice from a production test conforms to the provisions in Section 52-1.08C(3), "Ultimate Butt Splice Test Criteria," all splices in the lot represented by this production test will be rejected.
- If a production test for a lot fails, the Contractor shall repair or replace all reinforcing bars from which sample splices were removed, complete in place, before the Engineer selects additional splices from this lot for further testing.
- Production tests will not be required on repaired splices from a lot, regardless of the type of prequalified ultimate mechanical butt splice used to make the repair. However, should an additional production test be required, the Engineer may select any repaired splice for the additional production test.

52-1.08C(3)(b) Quality Assurance Test Requirements for Ultimate Butt Splices

- For the first production test performed, and for at least one, randomly selected by the Engineer, of every 5 subsequent production tests, or portion thereof, the Contractor shall concurrently prepare 4 additional ultimate quality assurance sample splices along with associated control bars.
- Each time 4 additional ultimate quality assurance sample splices are prepared, 2 of these quality assurance sample splice and associated control bar sets and 2 of the production sample splice and associated control bar sets, together, shall conform to the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."
- The 2 remaining quality assurance sample splice and associated control bar sets, along with the 2 remaining production sample splice and associated control bar sets shall be shipped to the Transportation Laboratory for quality assurance testing. The 4 sets shall be securely bundled together and identified by location and contract number with weatherproof markings before shipment. Bundles containing fewer than 4 sets will not be tested.
- Quality assurance testing will be performed in conformance with the requirements for ultimate production sample splices in Section 52-1.08C(3)(a), "Production Test Requirements for Ultimate Butt Splices."

52-1.08C(3)(c) Nondestructive Splice Tests

- When the specifications allow for welded sample splices to be taken from other than the completed lot of splices, the Contractor shall meet the following additional requirements.
- Except for resistance butt welded splices, radiographic examinations shall be performed on 25 percent of all complete joint penetration butt welded splices from a production lot. The size of a production lot will be a maximum of 150 splices. The Engineer will select the splices which will compose the production lot and also the splices within each production lot to be radiographically examined.
- All required radiographic examinations of complete joint penetration butt welded splices shall be performed by the Contractor in conformance with the requirements in AWS D 1.4 and these specifications.
- Before radiographic examination, welds shall conform to the requirements in Section 4.4, "Quality of Welds," of AWS D 1.4.
- Should more than 12 percent of the splices which have been radiographically examined in any production lot be defective, an additional 25 percent of the splices, selected by the Engineer from the same production lot, shall be radiographically examined. Should more than 12 percent of the cumulative total of splices tested from the same production lot be defective, all remaining splices in the lot shall be radiographically examined.
- Additional radiographic examinations performed due to the identification of defective splices shall be at the Contractor's expense.
- All defects shall be repaired in conformance with the requirements in AWS D 1.4.
- The Contractor shall notify the Engineer in writing 48 hours before performing any radiographic examinations.

- The radiographic procedure used shall conform to the requirements in AWS D1.1, AWS D1.4, and the following:

Two exposures shall be made for each complete joint penetration butt welded splice. For each of the 2 exposures, the radiation source shall be centered on each bar to be radiographed. The first exposure shall be made with the radiation source placed at zero degrees from the top of the weld and perpendicular to the weld root and identified with a station mark of "0." The second exposure shall be at 90 degrees to the "0" station mark and shall be identified with a station mark of "90." When obstructions prevent a 90 degree placement of the radiation source for the second exposure, and when approved in writing by the Engineer, the source may be rotated, around the centerline of the reinforcing bar, a maximum of 25 degrees.

For field produced complete joint penetration butt welds, no more than one weld shall be radiographed during one exposure. For shop produced complete joint penetration butt welds, if more than one weld is to be radiographed during one exposure, the angle between the root line of each weld and the direction to the radiation source shall be not less than 65 degrees.

Radiographs shall be made by either X-ray or gamma ray. Radiographs made by X-ray or gamma rays shall have densities of not less than 2.3 nor more than 3.5 in the area of interest. A tolerance of 0.05 in density is allowed for densitometer variations. Gamma rays shall be from the iridium 192 isotope and the emitting specimen shall not exceed 4.45 mm in the greatest diagonal dimension.

The radiographic film shall be placed perpendicular to the radiation source at all times; parallel to the root line of the weld unless source placement determines that the film must be turned; and as close to the root of the weld as possible.

The minimum source to film distance shall be maintained so as to ensure that all radiographs maintain a maximum geometric unsharpness of 0.020 at all times, regardless of the size of the reinforcing bars.

Penetrameters shall be placed on the source side of the bar and perpendicular to the radiation source at all times. One penetrometer shall be placed in the center of each bar to be radiographed, perpendicular to the weld root, and adjacent to the weld. Penetrometer images shall not appear in the weld area.

When radiography of more than one weld is being performed per exposure, each exposure shall have a minimum of one penetrometer per bar, or 3 penetrameters per exposure. When 3 penetrameters per exposure are used, one penetrometer shall be placed on each of the 2 outermost bars of the exposure, and the remaining penetrometer shall be placed on a centrally located bar.

An allowable weld buildup of 4 mm may be added to the total material thickness when determining the proper penetrometer selection. No image quality indicator equivalency will be accepted. Wire penetrameters or penetrometer blocks shall not be used.

Penetrameters shall be sufficiently shimmed using a radiographically identical material. Penetrometer image densities shall be a minimum of 2.0 and a maximum of 3.6.

Radiographic film shall be Class 1, regardless of the size of reinforcing bars.

Radiographs shall be free of film artifacts and processing defects, including, but not limited to, streaks, scratches, pressure marks or marks made for the purpose of identifying film or welding indications.

Each splice shall be clearly identified on each radiograph and the radiograph identification and marking system shall be established between the Contractor and the Engineer before radiographic inspection begins. Film shall be identified by lead numbers only; etching, flashing or writing in identifications of any type will not be permitted. Each piece of film identification information shall be legible and shall include, as a minimum, the following information: Contractor's name, date, name of nondestructive testing firm, initials of radiographer, contract number, part number and weld number. The letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld.

Radiographic film shall be developed within a time range of one minute less to one minute more than the film manufacturer's recommended maximum development time. Sight development will not be allowed.

Processing chemistry shall be done with a consistent mixture and quality, and processing rinses and tanks shall be clean to ensure proper results. Records of all developing processes and any chemical changes to the developing processes shall be kept and furnished to the Engineer upon request. The Engineer may request, at any time, that a sheet of unexposed film be processed in the presence of the Engineer to verify processing chemical and rinse quality.

The results of all radiographic interpretations shall be recorded on a signed certification and a copy kept with the film packet.

Technique sheets prepared in conformance with the requirements in ASME Boiler and Pressure Vessels Code, Section V, Article 2 Section T-291 shall also contain the developer temperature, developing time, fixing duration and all rinse times.

52-1.08D Reporting Test Results

- A Production Test Report for all testing performed on each lot shall be prepared by the independent testing laboratory performing the testing and submitted to the QCM for review and approval. The report shall be signed by an

engineer who represents the laboratory and is registered as a Civil Engineer in the State of California. The report shall include, as a minimum, the following information for each test: contract number, bridge number, lot number and location, bar size, type of splice, length of mechanical splice, length of test specimen, physical condition of test sample splice and any associated control bar, any notable defects, total measured slip, ultimate tensile strength of each splice, and for ultimate butt splices, limits of affected zone, location of visible necking area, ultimate tensile strength and 95 percent of this ultimate tensile strength for each control bar, and a comparison between 95 percent of the ultimate tensile strength of each control bar and the ultimate tensile strength of its associated splice.

- The QCM must review, approve, and forward each Production Test Report to the Engineer for review before the splices represented by the report are encased in concrete. The Engineer will have 3 working days to review each Production Test Report and respond in writing after a complete report has been received. Should the Contractor elect to encase any splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review and provide notification within the time allowed, and if, in the opinion of the Engineer, the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

- Quality assurance test results for each bundle of 4 sets or 4 samples of splices will be reported in writing to the Contractor within 3 working days after receipt of the bundle by the Transportation Laboratory. In the event that more than one bundle is received on the same day, 2 additional working days shall be allowed for providing test results for each additional bundle received. A test report will be made for each bundle received. Should the Contractor elect to encase splices before receiving notification from the Engineer, it is expressly understood that the Contractor will not be relieved of the responsibility for incorporating material in the work that conforms to the requirements of the plans and specifications. Material not conforming to these requirements will be subject to rejection. Should the Contractor elect to wait to encase splices pending notification by the Engineer, and in the event the Engineer fails to complete the review within the time allowed, and in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays."

Section 52-1.11, "Payment," of the Standard Specifications is amended by adding the following paragraph after the seventh paragraph:

- If a portion or all of the reinforcing steel is epoxy-coated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing the epoxy-coated reinforcement will be reduced \$5000 for each epoxy-coating facility located more than 480 air line kilometers from both Sacramento and Los Angeles and an additional \$3000 (\$8000 total) for each epoxy-coating facility located more than 4800 air line kilometers from both Sacramento and Los Angeles.

SECTION 55: STEEL STRUCTURES

Issue Date: December 31, 2001

Section 55-3.14, "Bolted Connections," of the Standard Specifications is amended by adding the following after the ninth paragraph:

- If a torque multiplier is used in conjunction with a calibrated wrench as a method for tightening fastener assemblies to the required tension, both the multiplier and the wrench shall be calibrated together as a system. The same length input and output sockets and extensions that will be used in the work shall also be included in the calibration of the system. The manufacturer's torque multiplication ratio shall be adjusted during calibration of the system, such that when this adjusted ratio is multiplied by the actual input calibrated wrench reading, the product is a calculated output torque that is within 2 percent of the true output torque. When this system is used in the work to perform any installation tension testing, rotational capacity testing, fastener tightening, or tension verification, it shall be used, intact as calibrated.

The sixth paragraph of Section 55-4.02, "Payment," of the Standard Specifications is amended to read:

- If a portion or all of the structural steel is fabricated more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and

extremely difficult to ascertain and determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing the structural steel from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$5000 or by an amount computed at \$0.044 per kilogram of structural steel fabricated, whichever is greater, or in the case of each fabrication site located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced \$8000 or by \$0.079 per kilogram of structural steel fabricated, whichever is greater.

SECTION 56: SIGNS

Issue Date: November 2, 2004

Section 56-1.01, "Description," of the Standard Specifications is amended by deleting the third paragraph.

Section 56-1.02A, "Bars, Plates and Shapes," of the Standard Specifications is amended to read:

56-1.02A Bars, Plates, Shapes, and Structural Tubing

- Bars, plates, and shapes shall be structural steel conforming to the requirements in ASTM Designation: A 36/A 36M, except, at the option of the Contractor, the light fixture mounting channel shall be continuous-slot steel channel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation SS, Grade 33[230], or aluminum Alloy 6063-T6 extruded aluminum conforming to the requirements in ASTM Designation: B 221 or B 221M.
- Structural tubing shall be structural steel conforming to the requirements in ASTM Designation: A 500, Grade B.
- Removable sign panel frames shall be constructed of structural steel conforming to the requirements in ASTM Designation: A 36/A 36M.

Section 56-1.02B, "Sheets," of the Standard Specifications is amended to read:

56-1.02B Sheets

- Sheets shall be carbon-steel sheets conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation SS, Grade 33[230].
- Ribbed sheet metal for box beam-closed truss sign structures shall be fabricated from galvanized sheet steel conforming to the requirements in ASTM Designation: A 653/A 653M, Designation SS, Grade 33[230]. Sheet metal panels shall be G 165 coating designation in conformance with the requirements in ASTM Designation: A 653/A 653M.

Section 56-1.02F, "Steel Walkway Gratings," of the Standard Specifications is amended to read:

56-1.02F Steel Walkway Gratings

- Steel walkway gratings shall be furnished and installed in conformance with the details shown on the plans and the following provisions:
 - A. Gratings shall be the standard product of an established grating manufacturer.
 - B. Material for gratings shall be structural steel conforming to the requirements in ASTM Designation: A 1011/A 1011M, Designation CS, Type B.
 - C. For welded type gratings, each joint shall be full resistance welded under pressure, to provide a sound, completely beaded joint.
 - D. For mechanically locked gratings, the method of fabrication and interlocking of the members shall be approved by the Engineer, and the fabricated grating shall be equal in strength to the welded type.
 - E. Gratings shall be accurately fabricated and free from warps, twists, or other defects affecting their appearance or serviceability. Ends of all rectangular panels shall be square. The tops of the bearing bars and cross members shall be in the same plane. Gratings distorted by the galvanizing process shall be straightened.

The sixth through the thirteenth paragraphs in Section 56-1.03, "Fabrication," of the Standard Specifications are amended to read:

- High-strength bolted connections, where shown on the plans, shall conform to the provisions in Section 55-3.14, "Bolted Connections," except that only fastener assemblies consisting of a high-strength bolt, nut, hardened washer, and direct tension indicator shall be used.
- High-strength fastener assemblies, and any other bolts, nuts, and washers attached to sign structures shall be zinc-coated by the mechanical deposition process.

- Nuts for high-strength bolts designated as snug-tight shall not be lubricated.
- An alternating snugging and tensioning pattern for anchor bolts and high-strength bolted splices shall be used. Once tensioned, high-strength fastener components and direct tension indicators shall not be reused.
- For bolt diameters less than 10 mm, the diameter of the bolt hole shall be not more than 0.80-mm larger than the nominal bolt diameter. For bolt diameters greater than or equal to 10 mm, the diameter of the bolt hole shall be not more than 1.6 mm larger than the nominal bolt diameter.
- Sign structures shall be fabricated into the largest practical sections prior to galvanizing.
- Ribbed sheet metal panels for box beam closed truss sign structures shall be fastened to the truss members by cap screws or bolts as shown on the plans, or by 4.76 mm stainless steel blind rivets conforming to Industrial Fasteners Institute, Standard IFI-114, Grade 51. The outside diameter of the large flange rivet head shall be not less than 15.88 mm in diameter. Web splices in ribbed sheet metal panels may be made with similar type blind rivets of a size suitable for the thickness of material being connected.
- Spalling or chipping of concrete structures shall be repaired by the Contractor at the Contractor's expense.
- Overhead sign supports shall have an aluminum identification plate permanently attached near the base, adjacent to the traffic side on one of the vertical posts, using either stainless steel rivets or stainless steel screws. As a minimum, the information on the plate shall include the name of the manufacturer, the date of manufacture and the contract number.

The fifth paragraph of Section 56-2.02B, "Wood Posts," of the Standard Specifications is amended to read:

- Douglas fir and Hem-Fir posts shall be treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and in conformance with AWPAs Use Category System: UC4A, Commodity Specification A. Posts shall be incised and the minimum retention of preservative shall be as specified in AWPAs Standards.

SECTION 57: TIMBER STRUCTURES

Issue Date: October 12, 2004

The second paragraph of Section 57-1.02A, "Structural Timber and Lumber," of the Standard Specifications is amended to read:

- When preservative treatment of timber and lumber is required, the treatment shall conform to the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPAs Use Category 4B. The type of treatment to be used will be shown on the plans or specified in the special provisions.

SECTION 58: PRESERVATIVE TREATMENT OF LUMBER, TIMBER AND PILING

Issue Date: November 2, 2004

The first paragraph of Section 58-1.02, "Treatment and Retention," of the Standard Specifications is amended to read:

- Unless otherwise permitted by the Engineer or otherwise specified in the special provisions, the timber, lumber and piling shall be pressure treated after all millwork is completed. The preservatives, treatment and results of treatment shall be in conformance with AWPAs Standards U1-03, "User Specification for Treated Wood," and T1-03, "Processing and Treatment." Except as provided below, treatment of lumber and timber shall conform to the specified AWPAs Use Category. The type of treatment to be used shall be one of those named in the special provisions, on the plans, or elsewhere in these specifications.

The second paragraph of Section 58-1.02, "Treatment and Retention," of the Standard Specifications is deleted.

SECTION 59: PAINTING

Issue Date: December 31, 2001

Section 59-2.01, "General," of the Standard Specifications is amended by adding the following paragraphs after the first paragraph:

- Unless otherwise specified, no painting Contractors or subcontractors will be permitted to commence work without having the following current "SSPC: The Society for Protective Coatings" (formerly the Steel Structures Painting Council) certifications in good standing:

- A. For cleaning and painting structural steel in the field, certification in conformance with the requirements in Qualification Procedure No. 1, "Standard Procedure For Evaluating Painting Contractors (Field Application to Complex Industrial Structures)" (SSPC-QP 1).
- B. For removing paint from structural steel, certification in conformance with the requirements in Qualification Procedure No. 2, "Standard Procedure For Evaluating Painting Contractors (Field Removal of Hazardous Coatings from Complex Structures)" (SSPC-QP 2).
- C. For cleaning and painting structural steel in a permanent painting facility, certification in conformance with the requirements in Qualification Procedure No. 3, "Standard Procedure For Evaluating Qualifications of Shop Painting Applicators" (SSPC-QP 3). The AISC's Sophisticated Paint Endorsement (SPE) quality program will be considered equivalent to SSPC-QP 3.

The third paragraph of Section 59-2.03, "Blast Cleaning," of the Standard Specifications is amended to read:

- Exposed steel or other metal surfaces to be blast cleaned shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "Commercial Blast Cleaning," of the "SSPC: The Society for Protective Coatings." Blast cleaning shall leave all surfaces with a dense, uniform, angular anchor pattern of not less than 35 μ m as measured in conformance with the requirements in ASTM Designation: D 4417.

The first paragraph of Section 59-2.06, "Hand Cleaning," of the Standard Specifications is amended to read:

- Dirt, loose rust and mill scale, or paint which is not firmly bonded to the surfaces shall be removed in conformance with the requirements in Surface Preparation Specification No. 2, "Hand Tool Cleaning," of the "SSPC: The Society for Protective Coatings." Edges of old remaining paint shall be feathered.

The fourth paragraph of Section 59-2.12, "Painting," of the Standard Specifications is amended to read:

- The dry film thickness of the paint will be measured in place with a calibrated Type 2 magnetic film thickness gage in conformance with the requirements of specification SSPC-PA2 of the "SSPC: The Society for Protective Coatings."

SECTION 75: MISCELLANEOUS METAL

Issue Date: November 2, 2004

The table in the tenth paragraph of Section 75-1.02, "Miscellaneous Iron and Steel," of the Standard Specifications is amended to read:

Material	Specification
Steel bars, plates and shapes	ASTM Designation: A 36/A 36M or A 575, A 576 (AISI or M Grades 1016 through 1030)
Steel fastener components for general applications:	
Bolts and studs	ASTM Designation: A 307
Headed anchor bolts	ASTM Designation: A 307, Grade B, including S1 supplementary requirements
Nonheaded anchor bolts	ASTM Designation: A 307, Grade C, including S1 supplementary requirements and S1.6 of AASHTO Designation: M 314 supplementary requirements or AASHTO Designation: M 314, Grade 36 or 55, including S1 supplementary requirements
High-strength bolts and studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: A 449, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Washers	ASTM Designation: F 844
Components of high-strength steel fastener assemblies for use in structural steel joints:	
Bolts	ASTM Designation: A 325, Type 1
Tension control bolts	ASTM Designation: F 1852, Type 1
Nuts	ASTM Designation: A 563, including Appendix X1*
Hardened washers	ASTM Designation: F 436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM Designation: F 959, Type 325, zinc-coated
Stainless steel fasteners (Alloys 304 & 316) for general applications:	
Bolts, screws, studs, threaded rods, and nonheaded anchor bolts	ASTM Designation: F 593 or F 738M
Nuts	ASTM Designation: F 594 or F 836M
Washers	ASTM Designation: A 240/A 240M and ANSI B 18.22M
Carbon-steel castings	ASTM Designation: A 27/A 27M, Grade 65-35 [450-240], Class 1
Malleable iron castings	ASTM Designation: A 47, Grade 32510 or A 47M, Grade 22010
Gray iron castings	ASTM Designation: A 48, Class 30B
Ductile iron castings	ASTM Designation: A 536, Grade 65-45-12
Cast iron pipe	Commercial quality
Steel pipe	Commercial quality, welded or extruded
Other parts for general applications	Commercial quality

* Zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dyed dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.

The second paragraph in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

- Miscellaneous bridge metal shall consist of the following, except as further provided in Section 51-1.19, "Utility Facilities," and in the special provisions:

- A. Bearing assemblies, equalizing bolts and expansion joint armor in concrete structures.
- B. Expansion joint armor in steel structures.
- C. Manhole frames and covers, frames and grates, ladder rungs, guard posts and access door assemblies.
- D. Deck drains, area drains, retaining wall drains, and drainage piping, except drainage items identified as "Bridge Deck Drainage System" in the special provisions.

The table in the eighteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Stud Diameter (millimeters)	Sustained Tension Test Load (kilonewtons)
29.01-33.00	137.9
23.01-29.00	79.6
21.01-23.00	64.1
* 18.01-21.00	22.2
15.01-18.00	18.2
12.01-15.00	14.2
9.01-12.00	9.34
6.00-9.00	4.23

* Maximum stud diameter permitted for mechanical expansion anchors.

The table in the nineteenth paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Stud Diameter (millimeters)	Ultimate Tensile Load (kilonewtons)
30.01-33.00	112.1
27.01-30.00	88.1
23.01-27.00	71.2
20.01-23.00	51.6
16.01-20.00	32.0
14.01-16.00	29.4
12.00-14.00	18.7

The table in the twenty-second paragraph of Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications is amended to read:

Installation Torque Values, (newton meters)			
Stud Diameter (millimeters)	Shell Type Mechanical Expansion Anchors	Integral Stud Type Mechanical Expansion Anchors	Resin Capsule Anchors and Cast-in-Place Inserts
29.01-33.00	—	—	540
23.01-29.00	—	—	315
21.01-23.00	—	—	235
18.01-21.00	110	235	200
15.01-18.00	45	120	100
12.01-15.00	30	65	40
9.01-12.00	15	35	24
6.00-9.00	5	10	—

The third paragraph in Section 75-1.035, "Bridge Joint Restrainer Units," of the Standard Specifications is amended to read:

- Cables shall be 19 mm preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized, and in conformance with the requirements in Federal Specification RR-W-410D, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer.

The second paragraph in Section 75-1.05, "Galvanizing," of the Standard Specifications is amended to read:

At the option of the Contractor, material thinner than 3.2 mm shall be galvanized either before fabrication in conformance with the requirements of ASTM Designation: A 653/A 653M, Coating Designation Z600, or after fabrication in conformance with the requirements of ASTM Designation: A 123, except that the weight of zinc coating shall average not less than 365 g per square meter of actual surface area with no individual specimen having a coating weight of less than 305 g per square meter.

SECTION 80: FENCES

Issue Date: October 12, 2004

The second paragraph of Section 80-3.01B(2), "Treated Wood Posts and Braces," of the Standard Specifications is amended to read:

- Posts and braces to be treated shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWP A Use Category System: UC4A, Commodity Specification A or B.

SECTION 83: RAILINGS AND BARRIERS

Issue Date: January 28, 2005

The first paragraph of Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- The rail elements, backup plates, terminal sections, end and return caps, bolts, nuts and other fittings shall conform to the requirements in AASHTO Designation: M 180, except as modified in this Section 83-1.02B and as specified in Section 83-1.02. The rail elements, backup plates, terminal sections, end and return caps shall conform to Class A, Type 1 W-Beam guard railing as shown in AASHTO Designation: M 180. The edges and center of the rail element shall contact each post block. Rail element joints shall be lapped not less than 316 mm and bolted. The rail metal, in addition to conforming to the requirements in AASHTO Designation: M 180, shall withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2.5 times the thickness of the plate.

The ninth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- The grades and species of wood posts and blocks shall be No. 1 timbers (also known as No. 1 structural) Douglas fir or No. 1 timbers Southern yellow pine. Wood posts and blocks shall be graded in conformance with the provisions in Section 57-2, "Structural Timber," of the Standard Specifications, except allowances for shrinkage after mill cutting shall in no case exceed 5 percent of the American Lumber Standards minimum sizes, at the time of installation.

The eleventh paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- After fabrication, wood posts and blocks shall be pressure treated in conformance with Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWP A Use Category System: UC4A, Commodity Specification A.

The twelfth paragraph in Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- If copper naphthenate, ammoniacal copper arsenate, chromated copper arsenate, ammoniacal copper zinc arsenate, ammoniacal copper quat or copper azole is used to treat the wood posts and blocks, the bolt holes shall be treated as follows:

- A. Before the bolts are inserted, bolt holes shall be filled with a grease, recommended by the manufacturer for corrosion protection, which will not melt or run at a temperature of 65°C.

The twenty-fourth paragraph of Section 83-1.02B, "Metal Beam Guard Railing," of the Standard Specifications is amended to read:

- End anchor assemblies and rail tensioning assemblies for metal beam guard railing shall be constructed as shown on the plans and shall conform to the following provisions:

An end anchor assembly (Type SFT) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a wood post, a steel foundation tube, a steel soil plate and hardware.

An end anchor assembly (Type CA) for metal beam guard railing shall consist of an anchor cable, an anchor plate, a single anchor rod or double anchor rods, hardware and one concrete anchor.

A rail tensioning assembly for metal beam guard railing shall consist of an anchor cable, an anchor plate, and hardware.

The anchor plate, metal plates, steel foundation tubes and steel soil plate shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M.

The anchor rods shall be fabricated of steel conforming to the requirements in ASTM Designation: A 36/A 36M, A 441 or A 572, or ASTM Designation: A 576, Grades 1018, 1019, 1021 or 1026. The eyes shall be hot forged or formed with full penetration welds. After fabrication, anchor rods with eyes that have been formed with any part of the eye below 870°C during the forming operation or with eyes that have been closed by welding shall be thermally stress relieved prior to galvanizing. The completed anchor rod, after galvanizing, shall develop a strength of 220 kN.

In lieu of built-up fabrication of anchor plates as shown on the plans, anchor plates may be press-formed from steel plate, with or without welded seams.

All bolts and nuts shall conform to the requirements in ASTM Designation: A 307, unless otherwise specified in the special provisions or shown on the plans.

Anchor cable shall be 19-mm preformed, 6 x 19, wire strand core or independent wire rope core (IWRC), galvanized in conformance with the requirements in Federal Specification RR-W-410D, right regular lay, manufactured of improved plow steel with a minimum breaking strength of 200 kN. Two certified copies of mill test reports of each manufactured length of cable used shall be furnished to the Engineer. The overall length of each cable anchor assembly shall be as shown on the plans, but shall be a minimum of 2 m.

Where shown on the plans, cable clips and a cable thimble shall be used to attach cable to the anchor rod. Thimbles shall be commercial quality, galvanized steel. Cable clips shall be commercial quality drop forged galvanized steel.

The swaged fitting shall be machined from hot-rolled bars of steel conforming to AISI Designation: C 1035, and shall be annealed suitable for cold swaging. The swaged fitting shall be galvanized before swaging. A lock pin hole to accommodate a 6-mm, plated, spring steel pin shall be drilled through the head of the swage fitting to retain the stud in proper position. The manufacturer's identifying mark shall be stamped on the body of the swage fitting.

The 25-mm nominal diameter stud shall conform to the requirements in ASTM Designation: A 449 after galvanizing. Prior to galvanizing, a 10-mm slot for the locking pin shall be milled in the stud end.

The swaged fittings, stud and nut assembly shall develop the specified breaking strength of the cable.

The cable assemblies shall be shipped as a complete unit including stud and nut.

Clevises shall be drop forged galvanized steel and shall develop the specified breaking strength of the cable.

One sample of cable properly fitted with swaged fitting and right hand thread stud at both ends as specified above, including a clevis when shown on the plans, one meter in total length, shall be furnished the Engineer for testing.

The portion of the anchor rod to be buried in earth shall be coated with a minimum 0.5-mm thickness of coal tar enamel conforming to AWWA Standard: C203 or a coal tar epoxy conforming to the requirements in Steel Structures Painting Council Paint Specification No. 16, Coal-Tar Epoxy-Polyimide Black Paint or Corps of Engineers Specification, Formula C-200a, Coal-Tar Epoxy Paint.

Metal components of the anchor assembly shall be fabricated in conformance with good shop practice and shall be hot-dip galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."

Anchor cables shall be tightened after the concrete anchor has cured for at least 5 days.

Concrete used to construct anchors for end anchor assemblies shall be Class 3 or minor concrete conforming to the provisions in Section 90, "Portland Cement Concrete."

Concrete shall be placed against undisturbed material of the excavated holes for end anchors. The top 300 mm of holes shall be formed, if required by the Engineer.

Reinforcing steel in concrete anchors for end anchor assemblies shall conform to the provisions in Section 52, "Reinforcement."

The second paragraph in Section 83-1.02D, "Steel Bridge Railing," of the Standard Specifications is amended to read:

- Structural shapes, tubing, plates, bars, bolts, nuts, and washers shall be structural steel conforming to the provisions in Section 55-2, "Materials." Other fittings shall be commercial quality.

The second and third paragraphs in Section 83-1.02E, "Cable Railing," of the Standard Specifications are replaced with the following paragraph:

- Pipe for posts and braces shall be standard steel pipe or pipe that conforms to the provisions in Section 80-4.01A, "Posts and Braces."

The fourteenth paragraph in Section 83-1.02I, "Chain Link Railing," of the Standard Specifications is amended to read:

- Chain link fabric shall be either 11-gage Type I zinc coated fabric conforming to the requirements in AASHTO Designation: M 181 or 11-gage Type IV polyvinyl chloride (PVC) coated fabric conforming to the requirements in Federal Specification RR-F-191/1D.

The second paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- Except for metal beam guard railing within the pay limits of a terminal system end treatment or transition railing (Type WB), metal beam guard railing will be measured by the meter along the face of the rail element from end post to end post of the completed railing at each installation. The point of measurement at each end post will be the center of the bolt attaching the rail element to the end post.

The seventh paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- The quantities of end anchor assemblies (Type SFT or Type CA) and rail tensioning assemblies will be measured as units determined from actual count. An end anchor assembly (Type CA) with 2 cables attached to one concrete anchor will be counted as one terminal anchor assembly (Type CA) for measurement and payment.

The eighth paragraph of Section 83-1.03, "Measurement," of the Standard Specifications is amended to read:

- The quantities of return and end caps and the various types of terminal sections for metal beam guard railing will be determined as units from actual count.

The third paragraph of Section 83-1.04, "Payment," of the Standard Specifications is amended to read:

- The contract unit prices paid for end anchor assembly (Type SFT), end anchor assembly (Type CA), and rail tensioning assembly shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the end anchor assemblies, complete in place, including drilling anchor plate bolt holes in rail elements, driving steel foundation tubes, excavating for concrete anchor holes and disposing of surplus material, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The fourth paragraph of Section 83-1.04, "Payment," of the Standard Specifications is amended to read:

- The contract unit prices paid for return caps, end caps, and the various types of terminal sections for metal beam guard railing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing terminal sections, return and end caps, complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

The second paragraph of Section 83-2.02B, "Thrie Beam Barrier," of the Standard Specifications is amended to read:

- Rail elements, backup plates, terminal connectors, terminal sections, and return caps shall conform to Class A, Type 1 thrie beam guard railing as shown in AASHTO Designation: M 180.

The fourteenth paragraph of Section 83-2.02B, "Thrie Beam Barrier," of the Standard Specifications is amended to read:

- All metal work shall be fabricated in the shop, and no punching, cutting or welding will be permitted in the field. Rail elements shall be lapped so that the exposed ends will not face approaching traffic. Terminal sections and return caps shall be installed in conformance with the manufacturer's recommendation.

The first paragraph in Section 83-2.02D(2), "Materials," of the Standard Specifications is amended to read:

- Type 50 and 60 series concrete barriers shall be constructed of minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," except as follows:
 - a. The maximum size of aggregate used for extruded or slip-formed concrete barriers shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5-mm or smaller than 9.5-mm.
 - b. If the 9.5-mm maximum size aggregate grading is used to construct extruded or slip-formed concrete barriers, the cementitious material content of the minor concrete shall be not less than 400 kg/m³.

The third paragraph in Section 83-2.02D(2), "Materials," of the Standard Specifications is amended to read:

- The concrete paving between the tops of the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) and the optional concrete slab at the base between the 2 walls of concrete barrier (Types 50E, 60E, 60GE, and 60SE) shall be constructed of minor concrete conforming to the provisions of Section 90-10, except that the minor concrete shall contain not less than 300 kg of cementitious material per cubic meter.

The first paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- Except for single thrie beam barrier within the pay limits of transition railing (Type STB), single thrie beam barrier will be measured by the meter from end post to end post along the face of the rail element of the installed barrier. Single thrie beam barriers constructed on each side of piers under structures or other obstructions will be measured for payment along each line of the installed barrier.

The second paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- Except for double thrie beam barrier within the pay limits of transition railing (Type DTB), double thrie beam barrier will be measured by the meter from end post to end post along the center line of the installed barrier.

The fifth paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- The quantity of return caps, terminal connectors and the various types of terminal sections for single and double thrie beam barriers will be determined as units from actual count.

The sixth paragraph of Section 83-2.03, "Measurement," of the Standard Specifications is amended to read:

- The quantity of end anchor assemblies will be paid for as units determined from actual count.

The first paragraph of Section 83-2.04, "Payment," of the Standard Specifications is amended to read:

- The various types of thrie beam barrier, measured as specified in Section 83-2.03, "Measurement," will be paid for at the contract price per meter for single or double thrie beam barrier, whichever applies, and the contract unit price or prices for end anchor assemblies, return caps, terminal connectors and the various types of terminal sections.

The second paragraph of Section 83-2.04, "Payment," of the Standard Specifications is amended to read:

- The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing the barrier, complete in place, including drilling holes for wood posts, driving posts, backfilling the space around posts, excavating and backfilling end anchor assembly holes, connecting thrie beam barrier to concrete surfaces and disposing of surplus excavated material, and for furnishing, placing, removing and disposing of the temporary railing for closing the gap between existing barrier and the barrier being

constructed as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer.

The fourth paragraph in Section 83-2.04, "Payments," of the Standard Specifications is amended to read:

- Steel plate barrier attached to concrete barrier at overhead sign foundations, electroliers, drainage structures, and other locations shown on the plans will be measured and paid for as the type of concrete barrier attached thereto.

SECTION 85: PAVEMENT MARKERS

Issue Date: May 16, 2003

The second through fifth paragraphs in Section 85-1.03, "Sampling, Tolerances and Packaging," of the Standard Specifications are amended to read:

Sampling

- Twenty markers selected at random will constitute a representative sample for each lot of markers.
- The lot size shall not exceed 25000 markers.

Tolerances

- Three test specimens will be randomly selected from the sample for each test and tested in conformance with these specifications. Should any one of the 3 specimens fail to conform with the requirements in these specifications, 6 additional specimens will be tested. The failure of any one of these 6 specimens shall be cause for rejection of the entire lot or shipment represented by the sample.
- The entire sample of retroreflective pavement markers will be tested for reflectance. The failure of 10 percent or more of the original sampling shall be cause for rejection.

Section 85-1.04, "Non-Reflective Pavement Markers," of the Standard Specifications is amended to read:

85-1.04 Non-Reflective Pavement Markers

- Non-reflective pavement markers (Types A and AY) shall be, at the option of the Contractor, either ceramic or plastic conforming to these specifications.
- The top surface of the marker shall be convex with a gradual change in curvature. The top, bottom and sides shall be free of objectionable marks or discoloration that will affect adhesion or appearance.
- The bottom of markers shall have areas of integrally formed protrusions or indentations, which will increase the effective bonding surface area of adhesive. The bottom surface of the marker shall not deviate more than 1.5 mm from a flat surface. The areas of protrusion shall have faces parallel to the bottom of the marker and shall project approximately one mm from the bottom.

The second through fourth paragraphs of Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications are deleted.

The table in the fifth paragraph in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," of the Standard Specifications is amended to read:

Testing

- Tests shall be performed in conformance with the requirements in California Test 669.

Test	Test Description	Requirement
a	Bond strength	4.8 MPa, min.
b	Glaze thickness	180 µm, min.
c	Hardness	6 Moh, min.
d	Luminance factor, Type A, white markers only, glazed surface	75, min.
e	Yellowness index, Type A, white markers only, glazed surface	7, max.
f	Color-yellow, Type AY, yellow markers only. The chromaticity coordinates shall be within a color box defined in CTM 669	Pass
g	Compressive strength	6700 N, min.
h	Water absorption	2.0 %, max.
i	Artificial weathering, 500 hours exposure, yellowness index	20, max.

Section 85-1.04B, "Non-Reflective Pavement Markers (Plastic)," of the Standard Specifications is amended to read:

85-1.04B Non-Reflective Pavement Markers (Plastic)

- Plastic non-reflective pavement markers Types A and AY shall be, at the option of the Contractor, either polypropylene or acrylonitrile-butadiene-styrene (ABS) plastic type.
- Plastic markers shall conform to the testing requirements specified in Section 85-1.04A, "Non-Reflective Pavement Markers (Ceramic)," except that Tests a, b, c, and h shall not apply. The plastic markers shall not be coated with substances that interfere with the ability of the adhesive bonding to the marker.

The sixth and seventh paragraphs in Section 85-1.05, "Retroreflective Pavement Markers," of the Standard Specifications are amended to read:

Testing

- Tests shall be performed in conformance with the requirements in California Test 669.

Test Description	Requirement		
Bond strength ^a	3.4 MPa, min.		
Compressive strength ^b	8900 N, min.		
Abrasion resistance, marker must meet the respective specific intensity minimum requirements after abrasion.	Pass		
Water Soak Resistance	No delamination of the body or lens system of the marker nor loss of reflectance		
Reflectance	Specific Intensity		
	Clear	Yellow	Red
0° Incidence Angle, min.	3.0	1.5	0.75
20° Incidence Angle, min.	1.2	0.60	0.30
After one year field evaluation	0.30	0.15	0.08
^a Failure of the marker body or filler material prior to reaching 3.4 MPa shall constitute a failing bond strength test. ^b Deformation of the marker of more than 3 mm at a load of less than 8900 N or delamination of the shell and the filler material of more than 3 mm regardless of the load required to break the marker shall be cause for rejection of the markers as specified in Section 85-1.03, "Sampling, Tolerances and Packaging."			

- Pavement markers to be placed in pavement recesses shall conform to the above requirements for retroreflective pavement markers except that the minimum compressive strength requirement shall be 5338 N.

The eighth paragraph of Section 85-1.05, "Retroreflective Pavement Markers" of the Standard Specifications is deleted.

The eighth paragraph in Section 85-1.06, "Replacement," of the Standard Specifications is amended to read:

- Epoxy adhesive shall not be used to apply non-reflective plastic pavement markers.

SECTION 86: SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

Issue Date: January 28, 2005

The first paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Except for concrete for cast-in-drilled-hole concrete pile foundations, portland cement concrete shall conform to Section 90-10, "Minor Concrete."

The fifth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Reinforced cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in Section 49, "Piling," with the following exceptions: 1) Material resulting from drilling holes shall be disposed of in conformance with the provisions in Section 86-2.01, "Excavating and Backfilling," and 2) Concrete filling for cast-in-drilled-hole concrete piles will not be considered as designated by compressive strength.

The seventh paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and anchor bolts shall be held in place by means of rigid top and bottom templates. The bottom template shall be made of steel. The bottom template shall provide proper spacing and alignment of the anchor bolts near their bottom embedded end. The bottom template shall be installed before placing footing concrete. Anchor bolts shall not be installed more than 1:40 from vertical.

Section 86-2.03, "Foundations," of the Standard Specifications is amended by deleting the eighth paragraph.

The twelfth paragraph of Section 86-2.03, "Foundations," of the Standard Specifications is amended to read:

- Plumbing of the standards shall be accomplished by adjusting the leveling nuts before placing the mortar or before the foundation is finished to final grade. Shims or other similar devices shall not be used for plumbing or raking of posts, standards, or pedestals. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made, firm contact shall exist between all bearing surfaces of the anchor bolt nuts, washers, and the base plates.

The first paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

86-2.04 STANDARDS, STEEL PEDESTALS, AND POSTS

- Standards for traffic signals and lighting, and steel pedestals for cabinets and other similar equipment, shall be located as shown on the plans. Bolts, nuts and washers, and anchor bolts for use in signal and lighting support structures shall conform to the provisions in Section 55-2, "Materials." Except when bearing-type connections or slipbases are specified, high-strength bolted connections shall conform to the provisions in Section 55-3.14, "Bolted Connections." Welding, nondestructive testing (NDT) of welds, and acceptance and repair criteria for NDT of steel members shall conform to the requirements of AWS D1.1 and the contract special provisions.

The second paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- On each lighting standard except Type 1, one rectangular corrosion resistant metal identification tag shall be permanently attached above the hand hole, near the base of the standard, using stainless steel rivets. On each signal pole support, two corrosion resistant metal identification tags shall be attached, one above the hand hole near the base of the vertical standard and one on the underside of the signal mast arm near the arm plate. As a minimum, the information on each identification tag shall include the name of the manufacturer, the date of manufacture, the identification number as shown on the plans, the contract number, and a unique identification code assigned by the fabricator. This number shall be traceable to

a particular contract and the welds on that component, and shall be readable after the support structure is coated and installed. The lettering shall be a minimum of 7 mm high. The information may be either depressed or raised, and shall be legible.

The fourth paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- Ferrous metal parts of standards, with shaft length of 4.6 m and longer, shall conform to the details shown on the plans, the provisions in Section 55-2, "Materials," except as otherwise noted, and the following requirements:

Except as otherwise specified, standards shall be fabricated from sheet steel of weldable grade having a minimum yield strength, after fabrication, of 276 MPa.

Certified test reports which verify conformance to the minimum yield strength requirements shall be submitted to the Engineer. The test reports may be the mill test reports for the as-received steel or, when the as-received steel has a lower yield strength than required, the Contractor shall provide supportive test data which provides assurance that the Contractor's method of cold forming will consistently increase the tensile properties of the steel to meet the specified minimum yield strength. The supportive test data shall include tensile properties of the steel after cold forming for specific heats and thicknesses.

When a single-ply 8-mm thick pole is specified, a 2-ply pole with equivalent section modulus may be substituted.

Standards may be fabricated of full-length sheets or shorter sections. Each section shall be fabricated from not more than 2 pieces of sheet steel. Where 2 pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the longitudinal welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of standard.

Butt-welded circumferential joints of tubular sections requiring CJP groove welds shall be made using a metal sleeve backing ring inside each joint. The sleeve shall be 3-mm nominal thickness, or thicker, and manufactured from steel having the same chemical composition as the steel in the tubular sections to be joined. When the sections to be joined have different specified minimum yield strengths, the steel in the sleeve shall have the same chemical composition as the tubular section having the higher minimum yield strength. The width of the metal sleeve shall be consistent with the type of NDT chosen and shall be a minimum width of 25 mm. The sleeve shall be centered at the joint and be in contact with the tubular section at the point of the weld at time of fit-up.

Welds shall be continuous.

The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint.

During fabrication, longitudinal seams on vertical tubular members of cantilevered support structures shall be centered on and along the side of the pole that the pole plate is located. Longitudinal seams on horizontal tubular members, including signal and luminaire arms, shall be within ± 45 degrees of the bottom of the arm.

The longitudinal seam welds in steel tubular sections may be made by the electric resistance welding process.

Longitudinal seam welds shall have 60 percent minimum penetration, except that within 150 mm of circumferential welds, longitudinal seam welds shall be CJP groove welds. In addition, longitudinal seam welds on lighting support structures having telescopic pole segment splices shall be CJP groove welds on the female end for a length on each end equal to the designated slip fit splice length plus 150 mm.

Exposed circumferential welds, except fillet and fatigue-resistant welds, shall be ground flush ($-0, +2$ mm) with the base metal prior to galvanizing or painting.

Circumferential welds and base plate-to-pole welds may be repaired only one time without written permission from the Engineer.

Exposed edges of the plates that make up the base assembly shall be finished smooth and exposed corners of the plates shall be broken unless otherwise shown on the plans. Shafts shall be provided with slip-fitter shaft caps.

Flatness of surfaces of 1) base plates that are to come in contact with concrete, grout, or washers and leveling nuts; 2) plates in high-strength bolted connections; 3) plates in joints where cap screws are used to secure luminaire and signal arms; and 4) plates used for breakaway slip base assemblies shall conform to the requirements in ASTM A6.

Standards shall be straight, with a permissive variation not to exceed 25 mm measured at the midpoint of a 9-m or 11-m standard and not to exceed 20 mm measured at the midpoint of a 5-m through 6-m standard. Variation shall not exceed 25 mm at a point 4.5 m above the base plate for Type 35 and Type 36 standards.

Zinc-coated nuts used on fastener assemblies having a specified preload (obtained by specifying a prescribed tension, torque value, or degree of turn) shall be provided with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the zinc coating on the nut so that the presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.

No holes shall be made in structural members unless the holes are shown on the plans or are approved in writing by the Engineer.

Standards with an outside diameter of 300 mm or less shall be round. Standards with an outside diameter greater than 300 mm shall be round or multisided. Multisided standards shall have a minimum of 12 sides which shall be convex and shall have a minimum bend radius of 100 mm.

Mast arms for standards shall be fabricated from material as specified for standards, and shall conform to the dimensions shown on the plans.

The cast steel option for slip bases shall be fabricated from material conforming to the requirements in ASTM Designation: A 27/A 27M, Grade 70-40. Other comparable material may be used if written permission is given by the Engineer. The casting tolerances shall be in conformance with the Steel Founder's Society of America recommendations (green sand molding).

One casting from each lot of 50 castings or less shall be subject to radiographic inspection, in conformance with the requirements in ASTM Designation: E 94. The castings shall comply with the acceptance criteria severity level 3 or better for the types and categories of discontinuities in conformance with the requirements in ASTM Designations: E 186 and E 446. If the one casting fails to pass the inspection, 2 additional castings shall be radiographed. Both of these castings shall pass the inspection, or the entire lot of 50 will be rejected.

Material certifications, consisting of physical and chemical properties, and radiographic films of the castings shall be filed at the manufacturer's office. These certifications and films shall be available for inspection upon request.

High-strength bolts, nuts, and flat washers used to connect slip base plates shall conform to the requirements in ASTM Designation: A 325 or A 325M and shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing."

Plate washers shall be fabricated by saw cutting and drilling steel plate conforming to the requirements in AISI Designation: 1018, and be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." Prior to galvanizing, burrs and sharp edges shall be removed and holes shall be chamfered sufficiently on each side to allow the bolt head to make full contact with the washer without tension on the bolt.

High-strength cap screws shown on the plans for attaching arms to standards shall conform to the requirements in ASTM Designation: A 325, A 325M, or A 449, and shall comply with the mechanical requirements in ASTM Designation: A 325 or A 325M after galvanizing. The cap screws shall be galvanized in conformance with the provisions in Section 75-1.05, "Galvanizing." The threads of the cap screws shall be coated with a colored lubricant that is clean and dry to the touch. The color of the lubricant shall be in contrast to the color of the zinc coating on the cap screw so that presence of the lubricant is visually obvious. In addition, either the lubricant shall be insoluble in water, or fastener components shall be shipped to the job site in a sealed container.

Unless otherwise specified, bolted connections attaching signal or luminaire arms to poles shall be considered slip critical. Galvanized faying surfaces on plates on luminaire and signal arms and matching plate surfaces on poles shall be roughened by hand using a wire brush prior to assembly and shall conform to the requirements for Class C surface conditions for slip-critical connections in "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," a specification approved by the Research Council on Structural Connections (RCSC) of the Engineering Foundation. For faying surfaces required to be painted, the paint shall be an approved type, brand, and thickness that has been tested and approved according to the RCSC Specification as a Class B coating.

Samples of fastener components will be randomly taken from each production lot by the Engineer and submitted, along with test reports required by appropriate ASTM fastener specifications, for QA testing and evaluation. Sample sizes for each fastener component shall be as determined by the Engineer.

The seventh paragraph of Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications is amended to read:

- To avoid interference of arm plate-to-tube welds with cap screw heads, and to ensure cap screw heads can be turned using conventional installation tools, fabricators shall make necessary adjustments to details prior to fabrication and properly locate the position of arm tubes on arm plates during fabrication.

The sixth and seventh paragraphs of 86-2.12, "Wood Poles," of the Standard Specifications are amended to read:

- After fabrication, wood poles shall be pressure treated in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," and AWPAC Use Category System: UC4B, Commodity Specification D.
- Wood poles, when specified in the special provisions to be painted, shall be treated with waterborne wood preservatives.

The first paragraph of Section 86-2.15, "Galvanizing," of the Standard Specifications is amended to read:

- Galvanizing shall be in conformance with the provisions in Section 75-1.05, "Galvanizing," except that cabinets may be constructed of material galvanized prior to fabrication in conformance with the requirements in ASTM Designation: A 653/653M, Coating Designation G 90, in which case all cut or damaged edges shall be painted with at least 2 applications of approved unthinned zinc-rich primer (organic vehicle type) conforming to the provisions in Section 91, "Paint." Aerosol cans shall not be used. Other types of protective coating must be approved by the Engineer prior to installation.

The first paragraph of Section 86-4.06, "Pedestrian Signal Faces" of the Standard Specifications is amended to read:

- Message symbols for pedestrian signal faces shall be white WALKING PERSON and Portland orange UPRAISED HAND conforming to the requirements in the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications," "Manual on Uniform Traffic Control Devices," and "MUTCD California Supplement." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

The tenth paragraph of Section 86-4.07, "Light Emitting Diode Pedestrian Signal Face 'Upraised Hand' Module" of the Standard Specifications is amended to read:

- The luminance of the "UPRAISED HAND" symbol shall be 3750 cd/m² minimum. The color of "UPRAISED HAND" shall be Portland orange conforming to the requirements of the Institute of Transportation Engineers Standards: "Pedestrian Traffic Control Signal Indications," "Manual on Uniform Traffic Control Devices," and "MUTCD California Supplement." The height of each symbol shall be not less than 250 mm and the width of each symbol shall be not less than 165 mm.

Section 86-8.01, "Payment," of the Standard Specifications is amended by adding the following paragraph after the first paragraph:

- If a portion or all of the poles for signal, lighting and electrical systems pursuant to Standard Specification Section 86, "Signals, Lighting and Electrical Systems," is fabricated more than 480 air line kilometers from both-Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impracticable and extremely difficult to ascertain and determine the actual increase in such expenses, it is agreed that payment to the Contractor for furnishing such items from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$5000; in addition, in the case where a fabrication site is located more than 4800 air line kilometers from both Sacramento and Los Angeles, payment will be reduced an additional \$3000 per each fabrication site (\$8000 total per site).

SECTION 88: ENGINEERING FABRIC

Issue Date: January 15, 2002

Section 88-1.02, "Pavement Reinforcing Fabric," of the Standard Specifications is amended to read:

- Pavement reinforcing fabric shall be 100 percent polypropylene staple fiber fabric material, needle-punched, thermally bonded on one side, and conform to the following:

Specification	Requirement
Weight, grams per square meter ASTM Designation: D 5261	140
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632	0.45
Elongation at break, percent min. ASTM Designation: D 4632	50
Asphalt retention by fabric, grams per square meter. (Residual Minimum) ASTM Designation: D 6140	900

Note: Weight, grab, elongation and asphalt retention are based on Minimum Average Roll Value (MARV)

SECTION 90: PORTLAND CEMENT CONCRETE

Issue Date: November 2, 2004

Section 90, "Portland Cement Concrete," of the Standard Specifications is amended to read:

SECTION 90: PORTLAND CEMENT CONCRETE

90-1 GENERAL

90-1.01 DESCRIPTION

- Portland cement concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, admixtures if used, and water, proportioned and mixed as specified in these specifications.
- The Contractor shall determine the mix proportions for concrete in conformance with these specifications. Unless otherwise specified, cementitious material shall be a combination of cement and mineral admixture. Cementitious material shall be either:
 1. "Type IP (MS) Modified" cement; or
 2. A combination of "Type II Modified" portland cement and mineral admixture; or
 3. A combination of Type V portland cement and mineral admixture.
- Type III portland cement shall be used only as allowed in the special provisions or with the approval of the Engineer.
- Class 1 concrete shall contain not less than 400 kg of cementitious material per cubic meter.
- Class 2 concrete shall contain not less than 350 kg of cementitious material per cubic meter.
- Class 3 concrete shall contain not less than 300 kg of cementitious material per cubic meter.
- Class 4 concrete shall contain not less than 250 kg of cementitious material per cubic meter.
- Minor concrete shall contain not less than 325 kg of cementitious material per cubic meter unless otherwise specified in these specifications or the special provisions.
- Unless otherwise designated on the plans or specified in these specifications or the special provisions, the amount of cementitious material used per cubic meter of concrete in structures or portions of structures shall conform to the following:

Use	Cementitious Material Content (kg/m ³)
Concrete designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min., 475 max.
Roof sections of exposed top box culverts	400 min., 475 max.
Other portions of structures	350 min., 475 max.
Concrete not designated by compressive strength:	
Deck slabs and slab spans of bridges	400 min.
Roof sections of exposed top box culverts	400 min.
Prestressed members	400 min.
Seal courses	400 min.
Other portions of structures	350 min.
Concrete for precast members	350 min., 550 max.

- Whenever the 28-day compressive strength shown on the plans is greater than 25 MPa, the concrete shall be designated by compressive strength. If the plans show a 28-day compressive strength that is 28 MPa or greater, an additional 14 days will be allowed to obtain the specified strength. The 28-day compressive strengths shown on the plans that are 25 MPa or less are shown for design information only and are not a requirement for acceptance of the concrete.
- Concrete designated by compressive strength shall be proportioned such that the concrete will attain the strength shown on the plans or specified in the special provisions.
- Before using concrete for which the mix proportions have been determined by the Contractor, or in advance of revising those mix proportions, the Contractor shall submit in writing to the Engineer a copy of the mix design.
- Compliance with cementitious material content requirements will be verified in conformance with procedures described in California Test 518 for cement content. For testing purposes, mineral admixture shall be considered to be

cement. Batch proportions shall be adjusted as necessary to produce concrete having the specified cementitious material content.

- If any concrete has a cementitious material, portland cement, or mineral admixture content that is less than the minimum required, the concrete shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place and the Contractor shall pay to the State \$0.55 for each kilogram of cementitious material, portland cement, or mineral admixture that is less than the minimum required. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract. The deductions will not be made unless the difference between the contents required and those actually provided exceeds the batching tolerances permitted by Section 90-5, "Proportioning." No deductions will be made based on the results of California Test 518.
- The requirements of the preceding paragraph shall not apply to minor concrete or commercial quality concrete.

90-2 MATERIALS

90-2.01 CEMENT

- Unless otherwise specified, cement shall be either "Type IP (MS) Modified" cement, "Type II Modified" portland cement or Type V portland cement.
- "Type IP (MS) Modified" cement shall conform to the requirements for Type IP (MS) cement in ASTM Designation: C 595, and shall be comprised of an intimate and uniform blend of Type II cement and not more than 35 percent by mass of mineral admixture. The type and minimum amount of mineral admixture used in the manufacture of "Type IP (MS) Modified" cement shall be in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."
- "Type II Modified" portland cement shall conform to the requirements for Type II portland cement in ASTM Designation: C 150-02a.
- In addition, "Type IP (MS) Modified" cement and "Type II Modified" portland cement shall conform to the following requirements:
 - A. The cement shall not contain more than 0.60-percent by mass of alkalis, calculated as the percentage of Na_2O plus 0.658 times the percentage of K_2O , when determined by either direct intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in conformance with the requirements in ASTM Designation: C 114;
 - B. The autoclave expansion shall not exceed 0.50-percent; and
 - C. Mortar, containing the cement to be used and Ottawa sand, when tested in conformance with California Test 527, shall not expand in water more than 0.010 percent and shall not contract in air more than 0.048 percent, except that when cement is to be used for precast prestressed concrete piling, precast prestressed concrete members, or steam cured concrete products, the mortar shall not contract in air more than 0.053 percent.
- Type III and Type V portland cements shall conform to the requirements in ASTM Designation: C 150-02a and the additional requirements listed above for "Type II Modified" portland cement, except that when tested in conformance with California Test 527, mortar containing Type III portland cement shall not contract in air more than 0.075 percent.
- Cement used in the manufacture of cast-in-place concrete for exposed surfaces of like elements of a structure shall be from the same cement mill.
- Cement shall be protected from exposure to moisture until used. Sacked cement shall be piled to permit access for tally, inspection, and identification of each shipment.
- Adequate facilities shall be provided to assure that cement meeting the provisions specified in this Section 90-2.01 shall be kept separate from other cement in order to prevent any but the specified cement from entering the work. Safe and suitable facilities for sampling cement shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper, in conformance with California Test 125.
- If cement is used prior to sampling and testing as provided in Section 6-1.07, "Certificates of Compliance," and the cement is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the cement manufacturer or supplier of the cement. If the cement is used in ready-mixed concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.
- Cement furnished without a Certificate of Compliance shall not be used in the work until the Engineer has had sufficient time to make appropriate tests and has approved the cement for use.

90-2.02 AGGREGATES

- Aggregates shall be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.
- Natural aggregates shall be thoroughly and uniformly washed before use.

- The Contractor, at the Contractor's expense, shall provide safe and suitable facilities, including necessary splitting devices for obtaining samples of aggregates, in conformance with California Test 125.
- Aggregates shall be of such character that it will be possible to produce workable concrete within the limits of water content provided in Section 90-6.06, "Amount of Water and Penetration."
- Aggregates shall have not more than 10 percent loss when tested for soundness in conformance with the requirements in California Test 214. The soundness requirement for fine aggregate will be waived, provided that the durability index, D_f , of the fine aggregate is 60, or greater, when tested for durability in conformance with California Test 229.
- If the results of any one or more of the Cleanness Value, Sand Equivalent, or aggregate grading tests do not meet the requirements specified for "Operating Range" but all meet the "Contract Compliance" requirements, the placement of concrete shall be suspended at the completion of the current pour until tests or other information indicate that the next material to be used in the work will comply with the requirements specified for "Operating Range."
- If the results of either or both the Cleanness Value and coarse aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete that is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- If the results of either or both the Sand Equivalent and fine aggregate grading tests do not meet the requirements specified for "Contract Compliance," the concrete which is represented by the tests shall be removed. However, if the Engineer determines that the concrete is structurally adequate, the concrete may remain in place, and the Contractor shall pay to the State \$4.60 per cubic meter for paving concrete and \$7.20 per cubic meter for all other concrete for the concrete represented by these tests and left in place. The Department may deduct the amount from any moneys due, or that may become due, the Contractor under the contract.
- The 2 preceding paragraphs apply individually to the "Contract Compliance" requirements for coarse aggregate and fine aggregate. When both coarse aggregate and fine aggregate do not conform to the "Contract Compliance" requirements, both paragraphs shall apply. The payments specified in those paragraphs shall be in addition to any payments made in conformance with the provisions in Section 90-1.01, "Description."
- No single Cleanness Value, Sand Equivalent or aggregate grading test shall represent more than 250 m³ of concrete or one day's pour, whichever is smaller.
- When the source of an aggregate is changed, the Contractor shall adjust the mix proportions and submit in writing to the Engineer a copy of the mix design before using the aggregates.

90-2.02A Coarse Aggregate

- Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, crushed air-cooled iron blast furnace slag or combinations thereof. Crushed air-cooled blast furnace slag shall not be used in reinforced or prestressed concrete.
- Coarse aggregate shall conform to the following quality requirements:

Tests	California Test	Requirements
Loss in Los Angeles Rattler (after 500 revolutions)	211	45% max.
Cleanness Value		
Operating Range	227	75 min.
Contract Compliance	227	71 min.

- In lieu of the above Cleanness Value requirements, a Cleanness Value "Operating Range" limit of 71, minimum, and a Cleanness Value "Contract Compliance" limit of 68, minimum, will be used to determine the acceptability of the coarse aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

1. coarse aggregate sampled at the completion of processing at the aggregate production plant had a Cleanness Value of not less than 82 when tested by California Test 227; and
2. prequalification tests performed in conformance with the requirements in California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.02B Fine Aggregate

- Fine aggregate shall consist of natural sand, manufactured sand produced from larger aggregate or a combination thereof. Manufactured sand shall be well graded.
- Fine aggregate shall conform to the following quality requirements:

Test	California Test	Requirements
Organic Impurities	213	Satisfactory ^a
Mortar Strengths Relative to Ottawa Sand	515	95%, min.
Sand Equivalent:		
Operating Range	217	75, min.
Contract Compliance	217	71, min.

a Fine aggregate developing a color darker than the reference standard color solution may be accepted if it is determined by the Engineer, from mortar strength tests, that a darker color is acceptable.

- In lieu of the above Sand Equivalent requirements, a Sand Equivalent "Operating Range" limit of 71 minimum and a Sand Equivalent "Contract Compliance" limit of 68 minimum will be used to determine the acceptability of the fine aggregate if the Contractor furnishes a Certificate of Compliance, as provided in Section 6-1.07, "Certificates of Compliance," certifying that:

1. fine aggregate sampled at the completion of processing at the aggregate production plant had a Sand Equivalent value of not less than 82 when tested by California Test 217; and
2. prequalification tests performed in conformance with California Test 549 indicated that the aggregate would develop a relative strength of not less than 95 percent and would have a relative shrinkage not greater than 105 percent, based on concrete.

90-2.03 WATER

- In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO₄, when tested in conformance with California Test 417. In prestressed concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 650 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1300 parts per million of sulfates as SO₄, when tested in conformance with California Test 417. In no case shall the water contain an amount of impurities that will cause either: 1) a change in the setting time of cement of more than 25 percent when tested in conformance with the requirements in ASTM Designation: C 191 or ASTM Designation: C 266 or 2) a reduction in the compressive strength of mortar at 14 days of more than 5 percent, when tested in conformance with the requirements in ASTM Designation: C 109, when compared to the results obtained with distilled water or deionized water, tested in conformance with the requirements in ASTM Designation: C 109.

- In non-reinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1500 parts per million of sulfates as SO₄, when tested in conformance with California Test 417.

- In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

- Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis (Na₂O + 0.658 K₂O) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

90-2.04 ADMIXTURE MATERIALS

- Admixture materials shall conform to the requirements in the following ASTM Designations:

- A. Chemical Admixtures—ASTM Designation: C 494.
- B. Air-entraining Admixtures—ASTM Designation: C 260.
- C. Calcium Chloride—ASTM Designation: D 98.

- D. Mineral Admixtures—Coal fly ash; raw or calcined natural pozzolan as specified in ASTM Designation: C 618; silica fume conforming to the requirements in ASTM Designation: C 1240, with reduction of mortar expansion of 80 percent, minimum, using the cement from the proposed mix design.

- Unless otherwise specified in the special provisions, mineral admixtures shall be used in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures."

90-3 AGGREGATE GRADINGS

90-3.01 GENERAL

- Before beginning concrete work, the Contractor shall submit in writing to the Engineer the gradation of the primary aggregate nominal sizes that the Contractor proposes to furnish. If a primary coarse aggregate or the fine aggregate is separated into 2 or more sizes, the proposed gradation shall consist of the gradation for each individual size, and the proposed proportions of each individual size, combined mathematically to indicate one proposed gradation. The proposed gradation shall meet the grading requirements shown in the table in this section, and shall show the percentage passing each of the sieve sizes used in determining the end result.

- The Engineer may waive, in writing, the gradation requirements in this Section 90-3.01 and in Sections 90-3.02, "Coarse Aggregate Grading," 90-3.03, "Fine Aggregate Grading," and 90-3.04, "Combined Aggregate Gradings," if, in the Engineer's opinion, furnishing the gradation is not necessary for the type or amount of concrete work to be constructed.

- Gradations proposed by the Contractor shall be within the following percentage passing limits:

Primary Aggregate Nominal Size	Sieve Size	Limits of Proposed Gradation
37.5-mm x 19-mm	25-mm	19 - 41
25-mm x 4.75-mm	19-mm	52 - 85
25-mm x 4.75-mm	9.5-mm	15 - 38
12.5-mm x 4.75-mm	9.5-mm	40 - 78
9.5-mm x 2.36-mm	9.5-mm	50 - 85
Fine Aggregate	1.18-mm	55 - 75
Fine Aggregate	600-μm	34 - 46
Fine Aggregate	300-μm	16 - 29

- Should the Contractor change the source of supply, the Contractor shall submit in writing to the Engineer the new gradations before their intended use.

90-3.02 COARSE AGGREGATE GRADING

- The grading requirements for coarse aggregates are shown in the following table for each size of coarse aggregate:

Sieve Sizes	Percentage Passing Primary Aggregate Nominal Sizes							
	37.5-mm x 19-mm		25-mm x 4.75-mm		12.5-mm x 4.75-mm		9.5-mm x 2.36-mm	
	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance	Operating Range	Contract Compliance
50-mm	100	100	—	—	—	—	—	—
37.5-mm	88-100	85-100	100	100	—	—	—	—
25-mm	x ± 18	X ± 25	88-100	86-100	—	—	—	—
19-mm	0-17	0-20	X ± 15	X ± 22	100	100	—	—
12.5-mm	—	—	—	—	82-100	80-100	100	100
9.5-mm	0-7	0-9	X ± 15	X ± 22	X ± 15	X ± 22	X ± 15	X ± 20
4.75-mm	—	—	0-16	0-18	0-15	0-18	0-25	0-28
2.36-mm	—	—	0-6	0-7	0-6	0-7	0-6	0-7

- In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."

- Coarse aggregate for the 37.5-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," shall be furnished in 2 or more primary aggregate nominal sizes. Each primary aggregate

nominal size may be separated into 2 sizes and stored separately, provided that the combined material conforms to the grading requirements for that particular primary aggregate nominal size.

- When the 25-mm, maximum, combined aggregate grading as provided in Section 90-3.04, "Combined Aggregate Gradings," is to be used, the coarse aggregate may be separated into 2 sizes and stored separately, provided that the combined material shall conform to the grading requirements for the 25-mm x 4.75-mm primary aggregate nominal size.

90-3.03 FINE AGGREGATE GRADING

- Fine aggregate shall be graded within the following limits:

Sieve Sizes	Percentage Passing	
	Operating Range	Contract Compliance
9.5-mm	100	100
4.75-mm	95-100	93-100
2.36-mm	65-95	61-99
1.18-mm	$X \pm 10$	$X \pm 13$
600- μ m	$X \pm 9$	$X \pm 12$
300- μ m	$X \pm 6$	$X \pm 9$
150- μ m	2-12	1-15
75- μ m	0-8	0-10

- In the above table, the symbol X is the gradation that the Contractor proposes to furnish for the specific sieve size as provided in Section 90-3.01, "General."
- In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the 1.18-mm sieve and the total percentage passing the 600- μ m sieve shall be between 10 and 40, and the difference between the percentage passing the 600- μ m and 300- μ m sieves shall be between 10 and 40.
- Fine aggregate may be separated into 2 or more sizes and stored separately, provided that the combined material conforms to the grading requirements specified in this Section 90-3.03.

90-3.04 COMBINED AGGREGATE GRADINGS

- Combined aggregate grading limits shall be used only for the design of concrete mixes. Concrete mixes shall be designed so that aggregates are combined in proportions that shall produce a mixture within the grading limits for combined aggregates as specified herein.
- The combined aggregate grading, except when otherwise specified in these specifications or the special provisions, shall be either the 37.5-mm, maximum grading, or the 25-mm, maximum grading, at the option of the Contractor.

Grading Limits of Combined Aggregates

Sieve Sizes	Percentage Passing			
	37.5-mm Max.	25-mm Max.	12.5-mm Max.	9.5-mm Max.
50-mm	100	—	—	—
37.5-mm	90-100	100	—	—
25-mm	50-86	90-100	—	—
19-mm	45-75	55-100	100	—
12.5-mm	—	—	90-100	100
9.5-mm	38-55	45-75	55-86	50 - 100
4.75-mm	30-45	35-60	45-63	45 - 63
2.36-mm	23-38	27-45	35-49	35 - 49
1.18-mm	17-33	20-35	25-37	25 - 37
600- μ m	10-22	12-25	15-25	15 - 25
300- μ m	4-10	5-15	5-15	5 - 15
150- μ m	1-6	1-8	1-8	1 - 8
75- μ m	0-3	0-4	0-4	0 - 4

- Changes from one grading to another shall not be made during the progress of the work unless permitted by the Engineer.

90-4 ADMIXTURES

90-4.01 GENERAL

- Admixtures used in portland cement concrete shall conform to and be used in conformance with the provisions in this Section 90-4 and the special provisions. Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option as provided herein.
- Chemical admixtures and air-entraining admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined by California Test 415, shall not be used in prestressed or reinforced concrete.
- Calcium chloride shall not be used in concrete except when otherwise specified.
- Mineral admixture used in concrete for exposed surfaces of like elements of a structure shall be from the same source and of the same percentage.
- Admixtures shall be uniform in properties throughout their use in the work. Should it be found that an admixture as furnished is not uniform in properties, its use shall be discontinued.
- If more than one admixture is used, the admixtures shall be compatible with each other so that the desirable effects of all admixtures used will be realized.

90-4.02 MATERIALS

- Admixture materials shall conform to the provisions in Section 90-2.04, "Admixture Materials."

90-4.03 ADMIXTURE APPROVAL

- No admixture brand shall be used in the work unless it is on the Department's current list of approved brands for the type of admixture involved.
- Admixture brands will be considered for addition to the approved list if the manufacturer of the admixture submits to the Transportation Laboratory a sample of the admixture accompanied by certified test results demonstrating that the admixture complies with the requirements in the appropriate ASTM Designation and these specifications. The sample shall be sufficient to permit performance of all required tests. Approval of admixture brands will be dependent upon a determination as to compliance with the requirements, based on the certified test results submitted, together with tests the Department may elect to perform.
- When the Contractor proposes to use an admixture of a brand and type on the current list of approved admixture brands, the Contractor shall furnish a Certificate of Compliance from the manufacturer, as provided in Section 6-1.07, "Certificates of Compliance," certifying that the admixture furnished is the same as that previously approved. If a previously approved admixture is not accompanied by a Certificate of Compliance, the admixture shall not be used in the work until the Engineer has had sufficient time to make the appropriate tests and has approved the admixture for use. The Engineer may take samples for testing at any time, whether or not the admixture has been accompanied by a Certificate of Compliance.
- If a mineral admixture is delivered directly to the site of the work, the Certificate of Compliance shall be signed by the manufacturer or supplier of the mineral admixture. If the mineral admixture is used in ready-mix concrete or in precast concrete products purchased as such by the Contractor, the Certificate of Compliance shall be signed by the manufacturer of the concrete or product.

90-4.04 REQUIRED USE OF CHEMICAL ADMIXTURES AND CALCIUM CHLORIDE

- When the use of a chemical admixture or calcium chloride is specified, the admixture shall be used at the dosage specified, except that if no dosage is specified, the admixture shall be used at the dosage normally recommended by the manufacturer of the admixture.
- Calcium chloride shall be dispensed in liquid, flake, or pellet form. Calcium chloride dispensed in liquid form shall conform to the provisions for dispensing liquid admixtures in Section 90-4.10, "Proportioning and Dispensing Liquid Admixtures."

90-4.05 OPTIONAL USE OF CHEMICAL ADMIXTURES

- The Contractor will be permitted to use Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM Designation: C 494 to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:
 - A. When a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by mass, except that the resultant cementitious material content shall be not less than 300 kilograms per cubic meter; and
 - B. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

- Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements in ASTM Designation: C 494, may be used in portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

90-4.06 REQUIRED USE OF AIR-ENTRAINING ADMIXTURES

- When air-entrainment is specified or ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce a concrete having the specified air content as determined by California Test 504.

90-4.07 OPTIONAL USE OF AIR-ENTRAINING ADMIXTURES

- When air-entrainment has not been specified or ordered by the Engineer, the Contractor will be permitted to use an air-entraining admixture to facilitate the use of any construction procedure or equipment provided that the average air content, as determined by California Test 504, of 3 successive tests does not exceed 4 percent, and no single test value exceeds 5.5 percent. If the Contractor elects to use an air-entraining admixture in concrete for pavement, the Contractor shall so indicate at the time the Contractor designates the source of aggregate as provided in Section 40-1.015, "Cement Content."

90-4.08 REQUIRED USE OF MINERAL ADMIXTURES

- Unless otherwise specified, mineral admixture shall be combined with cement to make cementitious material.
- The calcium oxide content shall not exceed 10 percent when determined in conformance with the requirements in ASTM Designation: C 114. The available alkali content (as sodium oxide equivalent) shall not exceed 1.5 percent when determined in conformance with the requirements in ASTM Designation: C 311, or the total alkali content (as sodium oxide equivalent) shall not exceed 5.0 percent when determined in conformance with the requirements in ASTM Designation: D 4326.

- The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," and shall conform to the following:

- A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content;
- B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:
 1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix;
 2. When the calcium oxide content of a mineral admixture is greater than 2 percent, the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix;
 3. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix
- C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

90-4.09 BLANK

90-4.10 PROPORTIONING AND DISPENSING LIQUID ADMIXTURES

- Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers for liquid admixtures shall have sufficient capacity to measure at one time the prescribed quantity required for each batch of concrete. Each dispenser shall include a graduated measuring unit into which liquid admixtures are measured to within ± 5 percent of the prescribed quantity for each batch. Dispensers shall be located and maintained so that the graduations can be accurately read from the point at which proportioning operations are controlled to permit a visual check of batching accuracy prior to discharge. Each measuring unit shall be clearly marked for the type and quantity of admixture.

- Each liquid admixture dispensing system shall be equipped with a sampling device consisting of a valve located in a safe and readily accessible position such that a sample of the admixture may be withdrawn slowly by the Engineer.
- If more than one liquid admixture is used in the concrete mix, each liquid admixture shall have a separate measuring unit and shall be dispensed by injecting equipment located in such a manner that the admixtures are not mixed at high concentrations and do not interfere with the effectiveness of each other. When air-entraining admixtures are used in conjunction with other liquid admixtures, the air-entraining admixture shall be the first to be incorporated into the mix.
- When automatic proportioning devices are required for concrete pavement, dispensers for liquid admixtures shall operate automatically with the batching control equipment. The dispensers shall be equipped with an automatic warning system in good operating condition that will provide a visible or audible signal at the point at which proportioning operations are controlled when the quantity of admixture measured for each batch of concrete varies from the preselected dosage by more than 5 percent, or when the entire contents of the measuring unit are not emptied from the dispenser into each batch of concrete.
- Unless liquid admixtures are added to premeasured water for the batch, their discharge into the batch shall be arranged to flow into the stream of water so that the admixtures are well dispersed throughout the batch, except that air-entraining admixtures may be dispensed directly into moist sand in the batching bins provided that adequate control of the air content of the concrete can be maintained.
- Liquid admixtures requiring dosages greater than 2.5 L/m³ shall be considered to be water when determining the total amount of free water as specified in Section 90-6.06, "Amount of Water and Penetration."
- Special admixtures, such as "high range" water reducers that may contribute to a high rate of slump loss, shall be measured and dispensed as recommended by the admixture manufacturer and as approved by the Engineer.

90-4.11 STORAGE, PROPORTIONING, AND DISPENSING OF MINERAL ADMIXTURES

- Mineral admixtures shall be protected from exposure to moisture until used. Sacked material shall be piled to permit access for tally, inspection and identification for each shipment.
- Adequate facilities shall be provided to assure that mineral admixtures meeting the specified requirements are kept separate from other mineral admixtures in order to prevent any but the specified mineral admixtures from entering the work. Safe and suitable facilities for sampling mineral admixtures shall be provided at the weigh hopper or in the feed line immediately in advance of the hopper.
- Mineral admixtures shall be incorporated into concrete using equipment conforming to the requirements for cement weigh hoppers, and charging and discharging mechanisms in ASTM Designation: C 94, in Section 90-5.03, "Proportioning," and in this Section 90-4.11.
- When concrete is completely mixed in stationary paving mixers, the mineral admixture shall be weighed in a separate weigh hopper conforming to the provisions for cement weigh hoppers and charging and discharging mechanisms in Section 90-5.03A, "Proportioning for Pavement," and the mineral admixture and cement shall be introduced simultaneously into the mixer proportionately with the aggregate. If the mineral admixture is not weighed in a separate weigh hopper, the Contractor shall provide certification that the stationary mixer is capable of mixing the cement, admixture, aggregates and water uniformly prior to discharge. Certification shall contain the following:

- A. Test results for 2 compressive strength test cylinders of concrete taken within the first one-third and 2 compressive strength test cylinders of concrete taken within the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength,"
- B. Calculations demonstrating that the difference in the averages of 2 compressive strengths taken in the first one-third is no greater than 7.5 percent different than the averages of 2 compressive strengths taken in the last one-third of the concrete discharged from a single batch from the stationary paving mixer. Strength tests and cylinder preparation will be in conformance with the provisions of Section 90-9, "Compressive Strength," and
- C. The mixer rotation speed and time of mixing prior to discharge that are required to produce a mix that meets the requirements above.

90-5 PROPORTIONING

90-5.01 STORAGE OF AGGREGATES

- Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size shall be avoided and also that the various sizes shall not become intermixed before proportioning.
- Aggregates shall be stored or stockpiled and handled in a manner that shall prevent contamination by foreign materials. In addition, storage of aggregates at batching or mixing facilities that are erected subsequent to the award of the contract and that furnish concrete to the project shall conform to the following:

- A. Intermingling of the different sizes of aggregates shall be positively prevented. The Contractor shall take the necessary measures to prevent intermingling. The preventive measures may include, but are not necessarily limited to, physical separation of stockpiles or construction of bulkheads of adequate length and height; and
- B. Contamination of aggregates by contact with the ground shall be positively prevented. The Contractor shall take the necessary measures to prevent contamination. The preventive measures shall include, but are not necessarily limited to, placing aggregates on wooden platforms or on hardened surfaces consisting of portland cement concrete, asphalt concrete, or cement treated material.

- In placing aggregates in storage or in moving the aggregates from storage to the weigh hopper of the batching plant, any method that may cause segregation, degradation, or the combining of materials of different gradings that will result in any size of aggregate at the weigh hopper failing to meet the grading requirements, shall be discontinued. Any method of handling aggregates that results in excessive breakage of particles shall be discontinued. The use of suitable devices to reduce impact of falling aggregates may be required by the Engineer.

90-5.02 PROPORTIONING DEVICES

- Weighing, measuring, or metering devices used for proportioning materials shall conform to the requirements in Section 9-1.01, "Measurement of Quantities," and this Section 90-5.02. In addition, automatic weighing systems shall comply with the requirements for automatic proportioning devices in Section 90-5.03A, "Proportioning for Pavement." Automatic devices shall be automatic to the extent that the only manual operation required for proportioning the aggregates, cement, and mineral admixture for one batch of concrete is a single operation of a switch or starter.

- Proportioning devices shall be tested at the expense of the Contractor as frequently as the Engineer may deem necessary to ensure their accuracy.

- Weighing equipment shall be insulated against vibration or movement of other operating equipment in the plant. When the plant is in operation, the mass of each batch of material shall not vary from the mass designated by the Engineer by more than the tolerances specified herein.

- Equipment for cumulative weighing of aggregate shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the aggregate. For systems with individual weigh hoppers for the various sizes of aggregate, the zero tolerance shall be ± 0.5 percent of the individual batch mass designated for each size of aggregate. Equipment for cumulative weighing of cement and mineral admixtures shall have a zero tolerance of ± 0.5 percent of the designated total batch mass of the cement and mineral admixture. Equipment for weighing cement or mineral admixture separately shall have a zero tolerance of ± 0.5 percent of their designated individual batch masses. Equipment for measuring water shall have a zero tolerance of ± 0.5 percent of its designated mass or volume.

- The mass indicated for any batch of material shall not vary from the preselected scale setting by more than the following:

- A. Aggregate weighed cumulatively shall be within 1.0 percent of the designated total batch mass of the aggregate. Aggregates weighed individually shall be within 1.5 percent of their respective designated batch masses; and
- B. Cement shall be within 1.0 percent of its designated batch mass. When weighed individually, mineral admixture shall be within 1.0 percent of its designated batch mass. When mineral admixture and cement are permitted to be weighed cumulatively, cement shall be weighed first to within 1.0 percent of its designated batch mass, and the total for cement and mineral admixture shall be within 1.0 percent of the sum of their designated batch masses; and
- C. Water shall be within 1.5 percent of its designated mass or volume.

- Each scale graduation shall be approximately 0.001 of the total capacity of the scale. The capacity of scales for weighing cement, mineral admixture, or cement plus mineral admixture and aggregates shall not exceed that of commercially available scales having single graduations indicating a mass not exceeding the maximum permissible mass variation above, except that no scale shall be required having a capacity of less than 500 kg, with 0.5-kg graduations.

90-5.03 PROPORTIONING

- Proportioning shall consist of dividing the aggregates into the specified sizes, each stored in a separate bin, and combining them with cement, mineral admixture, and water as provided in these specifications. Aggregates shall be proportioned by mass.

- At the time of batching, aggregates shall have been dried or drained sufficiently to result in a stable moisture content such that no visible separation of water from aggregate will take place during transportation from the proportioning plant to the point of mixing. In no event shall the free moisture content of the fine aggregate at the time of batching exceed 8 percent of its saturated, surface-dry mass.

- Should separate supplies of aggregate material of the same size group, but of different moisture content or specific gravity or surface characteristics affecting workability, be available at the proportioning plant, withdrawals shall be made from one supply exclusively and the materials therein completely exhausted before starting upon another.

- Bulk "Type IP (MS) Modified" cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer.

- Bulk cement and mineral admixture may be weighed in separate, individual weigh hoppers or may be weighed in the same weigh hopper and shall be kept separate from the aggregates until the ingredients are released for discharge into the mixer. If the cement and mineral admixture are weighed cumulatively, the cement shall be weighed first.

- When cement and mineral admixtures are weighed in separate weigh hoppers, the weigh systems for the proportioning of the aggregate, the cement, and the mineral admixture shall be individual and distinct from all other weigh systems. Each weigh system shall be equipped with a hopper, a lever system, and an indicator to constitute an individual and independent material weighing device. The cement and the mineral admixture shall be discharged into the mixer simultaneously with the aggregate.

- The scales and weigh hoppers for bulk weighing cement, mineral admixture, or cement plus mineral admixture shall be separate and distinct from the aggregate weighing equipment.

- For batches with a volume of one cubic meter or more, the batching equipment shall conform to one of the following combinations:

- A. Separate boxes and separate scale and indicator for weighing each size of aggregate.

- B. Single box and scale indicator for all aggregates.

- C. Single box or separate boxes and automatic weighing mechanism for all aggregates.

- In order to check the accuracy of batch masses, the gross mass and tare mass of batch trucks, truck mixers, truck agitators, and non-agitating hauling equipment shall be determined when ordered by the Engineer. The equipment shall be weighed at the Contractor's expense on scales designated by the Engineer.

90-5.03A Proportioning for Pavement

- Aggregates and bulk cement, mineral admixture, and cement plus mineral admixture for use in pavement shall be proportioned by mass by means of automatic proportioning devices of approved type conforming to these specifications.

- The Contractor shall install and maintain in operating condition an electronically actuated moisture meter that will indicate, on a readily visible scale, changes in the moisture content of the fine aggregate as it is batched within a sensitivity of 0.5 percent by mass of the fine aggregate.

- The batching of cement, mineral admixture, or cement plus mineral admixture and aggregate shall be interlocked so that a new batch cannot be started until all weigh hoppers are empty, the proportioning devices are within zero tolerance, and the discharge gates are closed. The interlock shall permit no part of the batch to be discharged until all aggregate hoppers and the cement and mineral admixture hoppers or the cement plus mineral admixture hopper are charged with masses that are within the tolerances specified in Section 90-5.02, "Proportioning Devices."

- When interlocks are required for cement and mineral admixture charging mechanisms and cement and mineral admixtures are weighed cumulatively, their charging mechanisms shall be interlocked to prevent the introduction of mineral admixture until the mass of cement in the cement weigh hopper is within the tolerances specified in Section 90-5.02, "Proportioning Devices."

- The discharge gate on the cement and mineral admixture hoppers or the cement plus mineral admixture hopper shall be designed to permit regulating the flow of cement, mineral admixture, or cement plus mineral admixture into the aggregate as directed by the Engineer.

- When separate weigh boxes are used for each size of aggregate, the discharge gates shall permit regulating the flow of each size of aggregate as directed by the Engineer.

- Material discharged from the several bins shall be controlled by gates or by mechanical conveyors. The means of withdrawal from the several bins, and of discharge from the weigh box, shall be interlocked so that not more than one bin can discharge at a time, and so that the weigh box cannot be tripped until the required quantity from each of the several bins has been deposited therein. Should a separate weigh box be used for each size of aggregate, all may be operated and discharged simultaneously.

- When the discharge from the several bins is controlled by gates, each gate shall be actuated automatically so that the required mass is discharged into the weigh box, after which the gate shall automatically close and lock.

- The automatic weighing system shall be designed so that all proportions required may be set on the weighing controller at the same time.

90-6 MIXING AND TRANSPORTING

90-6.01 GENERAL

- Concrete shall be mixed in mechanically operated mixers, except that when permitted by the Engineer, batches not exceeding 0.25 m³ may be mixed by hand methods in conformance with the provisions in Section 90-6.05, "Hand-Mixing."
- Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.
- Concrete shall be homogeneous and thoroughly mixed, and there shall be no lumps or evidence of undispersed cement, mineral admixture, or cement plus mineral admixture.
- Uniformity of concrete mixtures will be determined by differences in penetration as determined by California Test 533, or slump as determined by ASTM Designation: C 143, and by variations in the proportion of coarse aggregate as determined by California Test 529.
- When the mix design specifies a penetration value, the difference in penetration, determined by comparing penetration tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed 10 mm. When the mix design specifies a slump value, the difference in slump, determined by comparing slump tests on 2 samples of mixed concrete from the same batch or truck mixer load, shall not exceed the values given in the table below. Variation in the proportion of coarse aggregate will be determined by comparing the results of tests of 2 samples of mixed concrete from the same batch or truck mixer load and the difference between the 2 results shall not exceed 100 kg per cubic meter of concrete.

Average Slump	Maximum Permissible Difference
Less than 100-mm	25-mm
100-mm to 150-mm	38-mm
Greater than 150-mm to 225-mm	50-mm

- The Contractor, at the Contractor's expense, shall furnish samples of the freshly mixed concrete and provide satisfactory facilities for obtaining the samples.

90-6.02 MACHINE MIXING

- Concrete mixers may be of the revolving drum or the revolving blade type, and the mixing drum or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers and agitators that have an accumulation of hard concrete or mortar shall not be used.
- The temperature of mixed concrete, immediately before placing, shall be not less than 10°C or more than 32°C. Aggregates and water shall be heated or cooled as necessary to produce concrete within these temperature limits. Neither aggregates nor mixing water shall be heated to exceed 65°C. If ice is used to cool the concrete, discharge of the mixer will not be permitted until all ice is melted.
- The batch shall be so charged into the mixer that some water will enter in advance of cementitious materials and aggregates. All water shall be in the drum by the end of the first one-fourth of the specified mixing time.
- Cementitious materials shall be batched and charged into the mixer by means that will not result either in loss of cementitious materials due to the effect of wind, in accumulation of cementitious materials on surfaces of conveyors or hoppers, or in other conditions that reduce or vary the required quantity of cementitious material in the concrete mixture.
- Paving and stationary mixers shall be operated with an automatic timing device. The timing device and discharge mechanism shall be interlocked so that during normal operation no part of the batch will be discharged until the specified mixing time has elapsed.
- The total elapsed time between the intermingling of damp aggregates and all cementitious materials and the start of mixing shall not exceed 30 minutes.
- The size of batch shall not exceed the manufacturer's guaranteed capacity.
- When producing concrete for pavement or base, suitable batch counters shall be installed and maintained in good operating condition at jobsite batching plants and stationary mixers. The batch counters shall indicate the exact number of batches proportioned and mixed.
- Concrete shall be mixed and delivered to the jobsite by means of one of the following combinations of operations:
 - A. Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in truck agitators or in non-agitating hauling equipment (central-mixed concrete).
 - B. Mixed partially in a stationary mixer, and the mixing completed in a truck mixer (shrink-mixed concrete).
 - C. Mixed completely in a truck mixer (transit-mixed concrete).
 - D. Mixed completely in a paving mixer.

- Agitators may be truck mixers operating at agitating speed or truck agitators. Each mixer and agitator shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the manufacturer's guaranteed capacity of the drum or container in terms of the volume of mixed concrete and the speed of rotation of the mixing drum or blades.
- Truck mixers shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified.
- When shrink-mixed concrete is furnished, concrete that has been partially mixed at a central plant shall be transferred to a truck mixer and all requirements for transit-mixed concrete shall apply. No credit in the number of revolutions at mixing speed shall be allowed for partial mixing in a central plant.

90-6.03 TRANSPORTING MIXED CONCRETE

- Mixed concrete may be transported to the delivery point in truck agitators or truck mixers operating at the speed designated by the manufacturer of the equipment as agitating speed, or in non-agitating hauling equipment, provided the consistency and workability of the mixed concrete upon discharge at the delivery point is suitable for adequate placement and consolidation in place, and provided the mixed concrete after hauling to the delivery point conforms to the provisions in Section 90-6.01, "General."
- Truck agitators shall be loaded not to exceed the manufacturer's guaranteed capacity and shall maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.
- Bodies of non-agitating hauling equipment shall be constructed so that leakage of the concrete mix, or any part thereof, will not occur at any time.
- Concrete hauled in open-top vehicles shall be protected during hauling against rain or against exposure to the sun for more than 20 minutes when the ambient temperature exceeds 24°C.
- No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.
- The rate of discharge of mixed concrete from truck mixer-agitators shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open.
- When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time allowed may be less than 1.5 hours.
- When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be completed within one hour after the addition of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.
- Each load of concrete delivered at the jobsite shall be accompanied by a weighmaster certificate showing the mix identification number, non-repeating load number, date and time at which the materials were batched, the total amount of water added to the load, and for transit-mixed concrete, the reading of the revolution counter at the time the truck mixer is charged with cement. This weighmaster certificate shall also show the actual scale masses (kilograms) for the ingredients batched. Theoretical or target batch masses shall not be used as a substitute for actual scale masses.
- Weighmaster certificates shall be provided in printed form, or if approved by the Engineer, the data may be submitted in electronic media. Electronic media shall be presented in a tab-delimited format on a 90 mm diskette with a capacity of at least 1.4 megabytes. Captured data, for the ingredients represented by each batch shall be "line feed, carriage return" (LFCR) and "one line, separate record" with allowances for sufficient fields to satisfy the amount of data required by these specifications.
- The Contractor may furnish a weighmaster certificate accompanied by a separate certificate that lists the actual batch masses or measurements for a load of concrete provided that both certificates are imprinted with the same non-repeating load number that is unique to the contract and delivered to the jobsite with the load.
- Weighmaster certificates furnished by the Contractor shall conform to the provisions in Section 9-1.01, "Measurement of Quantities."

90-6.04 TIME OR AMOUNT OF MIXING

- Mixing of concrete in paving or stationary mixers shall continue for the required mixing time after all ingredients, except water and admixture, if added with the water, are in the mixing compartment of the mixer before any part of the batch is released. Transfer time in multiple drum mixers shall not be counted as part of the required mixing time.

- The required mixing time, in paving or stationary mixers, of concrete used for concrete structures, except minor structures, shall be not less than 90 seconds or more than 5 minutes, except that when directed by the Engineer in writing, the requirements of the following paragraph shall apply.
- The required mixing time, in paving or stationary mixers, except as provided in the preceding paragraph, shall be not less than 50 seconds or more than 5 minutes.
- The minimum required revolutions at the mixing speed for transit-mixed concrete shall not be less than that recommended by the mixer manufacturer, but in no case shall the number of revolutions be less than that required to consistently produce concrete conforming to the provisions for uniformity in Section 90-6.01, "General."

90-6.05 HAND-MIXING

- Hand-mixed concrete shall be made in batches of not more than 0.25 m³ and shall be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and spread on the platform and the fine aggregate shall be spread on this layer, the 2 layers being not more than 0.3 meters in total depth. On this mixture shall be spread the dry cement and mineral admixture and the whole mass turned no fewer than 2 times dry; then sufficient clean water shall be added, evenly distributed, and the whole mass again turned no fewer than 3 times, not including placing in the carriers or forms.

90-6.06 AMOUNT OF WATER AND PENETRATION

- The amount of water used in concrete mixes shall be regulated so that the penetration of the concrete as determined by California Test 533 or the slump of the concrete as determined by ASTM Designation: C 143 is within the "Nominal" values shown in the following table. When the penetration or slump of the concrete is found to exceed the nominal values listed, the mixture of subsequent batches shall be adjusted to reduce the penetration or slump to a value within the nominal range shown. Batches of concrete with a penetration or slump exceeding the maximum values listed shall not be used in the work. When Type F or Type G chemical admixtures are added to the mix, the penetration requirements shall not apply and the slump shall not exceed 225 mm after the chemical admixtures are added.

Type of Work	Nominal		Maximum	
	Penetration (mm)	Slump (mm)	Penetration (mm)	Slump (mm)
Concrete Pavement	0-25	—	40	—
Non-reinforced concrete facilities	0-35	—	50	—
Reinforced concrete structures				
Sections over 300-mm thick	0-35	—	65	—
Sections 300-mm thick or less	0-50	—	75	—
Concrete placed under water	—	150-200	—	225
Cast-in-place concrete piles	65-90	130-180	100	200

- The amount of free water used in concrete shall not exceed 183 kg/m³, plus 20 kg for each required 100 kg of cementitious material in excess of 325 kg/m³.
- The term free water is defined as the total water in the mixture minus the water absorbed by the aggregates in reaching a saturated surface-dry condition.
- Where there are adverse or difficult conditions that affect the placing of concrete, the above specified penetration and free water content limitations may be exceeded providing the Contractor is granted permission by the Engineer in writing to increase the cementitious material content per cubic meter of concrete. The increase in water and cementitious material shall be at a ratio not to exceed 30 kg of water per added 100 kg of cementitious material per cubic meter. The cost of additional cementitious material and water added under these conditions shall be at the Contractor's expense and no additional compensation will be allowed therefor.
- The equipment for supplying water to the mixer shall be constructed and arranged so that the amount of water added can be measured accurately. Any method of discharging water into the mixer for a batch shall be accurate within 1.5 percent of the quantity of water required to be added to the mix for any position of the mixer. Tanks used to measure water shall be designed so that water cannot enter while water is being discharged into the mixer and discharge into the mixer shall be made rapidly in one operation without dribbling. All equipment shall be arranged so as to permit checking the amount of water delivered by discharging into measured containers.

90-7 CURING CONCRETE

90-7.01 METHODS OF CURING

- Newly placed concrete shall be cured by the methods specified in this Section 90-7.01 and the special provisions.

90-7.01A Water Method

- The concrete shall be kept continuously wet by the application of water for a minimum curing period of 7 days after the concrete has been placed.
- When a curing medium consisting of cotton mats, rugs, carpets, or earth or sand blankets is to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.
- At the option of the Contractor, a curing medium consisting of white opaque polyethylene sheeting extruded onto burlap may be used to cure concrete structures. The polyethylene sheeting shall have a minimum thickness of 100 μm , and shall be extruded onto 283.5 gram burlap.
- At the option of the Contractor, a curing medium consisting of polyethylene sheeting may be used to cure concrete columns. The polyethylene sheeting shall have a minimum thickness of 250 μm achieved in a single layer of material.
- If the Contractor chooses to use polyethylene sheeting or polyethylene sheeting on burlap as a curing medium as specified above, these mediums and any joints therein shall be secured as necessary to provide moisture retention and shall be within 75 mm of the concrete at all points along the surface being cured. When these mediums are used, the temperature of the concrete shall be monitored during curing. If the temperature of the concrete cannot be maintained below 60°C, this method of curing shall be discontinued, and one of the other curing methods allowed for the concrete shall be used.
- When concrete bridge decks and flat slabs are to be cured without the use of a curing medium, the entire surface of the bridge deck or slab shall be kept damp by the application of water with an atomizing nozzle as specified in the preceding paragraph, until the concrete has set, after which the entire surface of the concrete shall be sprinkled continuously with water for a period of not less than 7 days.

90-7.01B Curing Compound Method

- Surfaces of the concrete that are exposed to the air shall be sprayed uniformly with a curing compound.
- Curing compounds to be used shall be as follows:
 - Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B, except the resin type shall be poly-alpha-methylstyrene.
 - Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class B.
 - Pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 2, Class A.
 - Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class B.
 - Non-pigmented curing compound conforming to the requirements in ASTM Designation: C 309, Type 1, Class A.
 - Non-pigmented curing compound with fugitive dye conforming to the requirements in ASTM Designation: C 309, Type 1-D, Class A.
- The infrared scan for the dried vehicle from curing compound (1) shall match the infrared scan on file at the Transportation Laboratory.
- The loss of water for each type of curing compound, when tested in conformance with the requirements in California Test 534, shall not be more than 0.15-kg/m² in 24 hours.
- The curing compound to be used will be specified elsewhere in these specifications or in the special provisions.
- When the use of curing compound is required or permitted elsewhere in these specifications or in the special provisions and no specific kind is specified, any of the curing compounds listed above may be used.
- Curing compound shall be applied at a nominal rate of 3.7 m²/L, unless otherwise specified.
- At any point, the application rate shall be within ± 1.2 m²/L of the nominal rate specified, and the average application rate shall be within ± 0.5 m²/L of the nominal rate specified when tested in conformance with the requirements in California Test 535. Runs, sags, thin areas, skips, or holidays in the applied curing compound shall be evidence that the application is not satisfactory.
- Curing compounds shall be applied using power operated spray equipment. The power operated spraying equipment shall be equipped with an operational pressure gage and a means of controlling the pressure. Hand spraying of

small and irregular areas that are not reasonably accessible to mechanical spraying equipment, in the opinion of the Engineer, may be permitted.

- The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle as specified in Section 90-7.01A, "Water Method," shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound.

- At the time of use, compounds containing pigments shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. A paddle shall be used to loosen all settled pigment from the bottom of the container, and a power driven agitator shall be used to disperse the pigment uniformly throughout the vehicle.

- Agitation shall not introduce air or other foreign substance into the curing compound.

- The manufacturer shall include in the curing compound the necessary additives for control of sagging, pigment settling, leveling, de-emulsification, or other requisite qualities of a satisfactory working material. Pigmented curing compounds shall be manufactured so that the pigment does not settle badly, does not cake or thicken in the container, and does not become granular or curdled. Settlement of pigment shall be a thoroughly wetted, soft, mushy mass permitting the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with minimum resistance to the sideways manual motion of the paddle across the bottom of the container, to form a smooth uniform product of the proper consistency.

- Curing compounds shall remain sprayable at temperatures above 4°C and shall not be diluted or altered after manufacture.

- The curing compound shall be packaged in clean 1040-L totes, 210-L barrels

or 19-L pails shall be supplied from a suitable storage tank located at the jobsite. The containers shall comply with "Title 49, Code of Federal Regulations, Hazardous Materials Regulations." The 1040-L totes and the 210-L barrels shall have removable lids and airtight fasteners. The 19-L pails shall be round and have standard full open head and bail. Lids with bungholes shall not be permitted. Settling or separation of solids in containers, except tanks, must be completely redispersed with low speed mixing prior to use, in conformance with these specifications and the manufacturer's recommendations. Mixing shall be accomplished either manually by use of a paddle or by use of a mixing blade driven by a drill motor, at low speed. Mixing blades shall be the type used for mixing paint. On site storage tanks shall be kept clean and free of contaminants. Each tank shall have a permanent system designed to completely redisperse settled material without introducing air or other foreign substances.

- Steel containers and lids shall be lined with a coating that will prevent destructive action by the compound or chemical agents in the air space above the compound. The coating shall not come off the container or lid as skins. Containers shall be filled in a manner that will prevent skinning. Plastic containers shall not react with the compound.

- Each container shall be labeled with the manufacturer's name, kind of curing compound, batch number, volume, date of manufacture, and volatile organic compound (VOC) content. The label shall also warn that the curing compound containing pigment shall be well stirred before use. Precautions concerning the handling and the application of curing compound shall be shown on the label of the curing compound containers in conformance with the Construction Safety Orders and General Industry Safety Orders of the State of California.

- Containers of curing compound shall be labeled to indicate that the contents fully comply with the rules and regulations concerning air pollution control in the State of California.

- When the curing compound is shipped in tanks or tank trucks, a shipping invoice shall accompany each load. The invoice shall contain the same information as that required herein for container labels.

- Curing compound will be sampled by the Engineer at the source of supply or at the jobsite or at both locations.

- Curing compound shall be formulated so as to maintain the specified properties for a minimum of one year. The Engineer may require additional testing before use to determine compliance with these specifications if the compound has not been used within one year or whenever the Engineer has reason to believe the compound is no longer satisfactory.

- Tests will be conducted in conformance with the latest ASTM test methods and methods in use by the Transportation Laboratory.

90-7.01C Waterproof Membrane Method

- The exposed finished surfaces of concrete shall be sprayed with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the curing membrane shall be placed. The curing membrane shall remain in place for a period of not less than 72 hours.

- Sheeting material for curing concrete shall conform to the requirements in AASHTO Designation: M 171 for white reflective materials.

- The sheeting material shall be fabricated into sheets of such width as to provide a complete cover for the entire concrete surface. Joints in the sheets shall be securely cemented together in such a manner as to provide a waterproof joint. The joint seams shall have a minimum lap of 100 mm.

- The sheets shall be securely weighted down by placing a bank of earth on the edges of the sheets or by other means satisfactory to the Engineer.

- Should any portion of the sheets be broken or damaged before the expiration of 72 hours after being placed, the broken or damaged portions shall be immediately repaired with new sheets properly cemented into place.

- Sections of membrane that have lost their waterproof qualities or have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

90-7.01D Forms-In-Place Method

- Formed surfaces of concrete may be cured by retaining the forms in place. The forms shall remain in place for a minimum period of 7 days after the concrete has been placed, except that for members over 0.5-m in least dimension the forms shall remain in place for a minimum period of 5 days.

- Joints in the forms and the joints between the end of forms and concrete shall be kept moisture tight during the curing period. Cracks in the forms and cracks between the forms and the concrete shall be resealed by methods subject to the approval of the Engineer.

90-7.02 CURING PAVEMENT

- The entire exposed area of the pavement, including edges, shall be cured by the waterproof membrane method, or curing compound method using curing compound (1) or (2) as the Contractor may elect. Should the side forms be removed before the expiration of 72 hours following the start of curing, the exposed pavement edges shall also be cured. If the pavement is cured by means of the curing compound method, the sawcut and all portions of the curing compound that have been disturbed by sawing operations shall be restored by spraying with additional curing compound.

- Curing shall commence as soon as the finishing process provided in Section 40-1.10, "Final Finishing," has been completed. The method selected shall conform to the provisions in Section 90-7.01, "Methods of Curing."

- When the curing compound method is used, the compound shall be applied to the entire pavement surface by mechanical sprayers. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator that provides for continual agitation of the curing compound during the time of application. The spray shall be adequately protected against wind, and the nozzles shall be so oriented or moved mechanically transversely as to result in the minimum specified rate of coverage being applied uniformly on exposed faces. Hand spraying of small and irregular areas, and areas inaccessible to mechanical spraying equipment, in the opinion of the Engineer, will be permitted. When the ambient air temperature is above 15°C, the Contractor shall fog the surface of the concrete with a fine spray of water as specified in Section 90-7.01A, "Water Method." The surface of the pavement shall be kept moist between the hours of 10:00 a.m. and 4:30 p.m. on the day the concrete is placed. However, the fogging done after the curing compound has been applied shall not begin until the compound has set sufficiently to prevent displacement. Fogging shall be discontinued if ordered in writing by the Engineer.

90-7.03 CURING STRUCTURES

- Newly placed concrete for cast-in-place structures, other than highway bridge decks, shall be cured by the water method, the forms-in-place method, or, as permitted herein, by the curing compound method, in conformance with the provisions in Section 90-7.01, "Methods of Curing."

- The curing compound method using a pigmented curing compound may be used on concrete surfaces of construction joints, surfaces that are to be buried underground, and surfaces where only Ordinary Surface Finish is to be applied and on which a uniform color is not required and that will not be visible from a public traveled way. If the Contractor elects to use the curing compound method on the bottom slab of box girder spans, the curing compound shall be curing compound (1).

- The top surface of highway bridge decks shall be cured by both the curing compound method and the water method. The curing compound shall be curing compound (1).

- Concrete surfaces of minor structures, as defined in Section 51-1.02, "Minor Structures," shall be cured by the water method, the forms-in-place method or the curing compound method.

- When deemed necessary by the Engineer during periods of hot weather, water shall be applied to concrete surfaces being cured by the curing compound method or by the forms-in-place method, until the Engineer determines that a cooling effect is no longer required. Application of water for this purpose will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."

90-7.04 CURING PRECAST CONCRETE MEMBERS

- Precast concrete members shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing." Curing shall be provided for the minimum time specified for each method or until the concrete reaches

its design strength, whichever is less. Steam curing may also be used for precast members and shall conform to the following provisions:

- A. After placement of the concrete, members shall be held for a minimum 4-hour presteaming period. If the ambient air temperature is below 10°C, steam shall be applied during the presteaming period to hold the air surrounding the member at a temperature between 10°C and 32°C.
- B. To prevent moisture loss on exposed surfaces during the presteaming period, members shall be covered as soon as possible after casting or the exposed surfaces shall be kept wet by fog spray or wet blankets.
- C. Enclosures for steam curing shall allow free circulation of steam about the member and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture.
- D. Steam at the jets shall be at low pressure and in a saturated condition. Steam jets shall not impinge directly on the concrete, test cylinders, or forms. During application of the steam, the temperature rise within the enclosure shall not exceed 22°C per hour. The curing temperature throughout the enclosure shall not exceed 65°C and shall be maintained at a constant level for a sufficient time necessary to develop the required transfer strength. Control cylinders shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.
- E. Temperature recording devices that will provide an accurate, continuous, permanent record of the curing temperature shall be provided. A minimum of one temperature recording device per 60 m of continuous bed length will be required for checking temperature.
- F. Members in pretension beds shall be detensioned immediately after the termination of steam curing while the concrete and forms are still warm, or the temperature under the enclosure shall be maintained above 15°C until the stress is transferred to the concrete.
- G. Curing of precast concrete will be considered completed after termination of the steam curing cycle.

90-7.05 CURING PRECAST PRESTRESSED CONCRETE PILES

- Newly placed concrete for precast prestressed concrete piles shall be cured in conformance with the provisions in Section 90-7.04, "Curing Precast Concrete Members," except that piles in a corrosive environment shall be cured as follows:
 - A. Piles shall be either steam cured or water cured. If water curing is used, the piles shall be kept continuously wet by the application of water in conformance with the provisions in Section 90-7.01A, "Water Method."
 - B. If steam curing is used, the steam curing provisions in Section 90-7.04, "Curing Precast Concrete Members," shall apply except that the piles shall be kept continuously wet for their entire length for a period of not less than 3 days, including the holding and steam curing periods.

90-7.06 CURING SLOPE PROTECTION

- Concrete slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."
- Concreted-rock slope protection shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing," or with a blanket of earth kept wet for 72 hours, or by sprinkling with a fine spray of water every 2 hours during the daytime for a period of 3 days.

90-7.07 CURING MISCELLANEOUS CONCRETE WORK

- Exposed surfaces of curbs shall be cured by pigmented curing compounds as specified in Section 90-7.01B, "Curing Compound Method."
- Concrete sidewalks, gutter depressions, island paving, curb ramps, driveways, and other miscellaneous concrete areas shall be cured in conformance with any of the methods specified in Section 90-7.01, "Methods of Curing."
- Shotcrete shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."
- Mortar and grout shall be cured by keeping the surface damp for 3 days.
- After placing, the exposed surfaces of sign structure foundations, including pedestal portions, if constructed, shall be cured for at least 72 hours by spraying with water, or by a moist earth blanket, or by any of the methods provided in Section 90-7.01, "Methods of Curing."

90-8 PROTECTING CONCRETE

90-8.01 GENERAL

- In addition to the provisions in Section 7-1.16, "Contractor's Responsibility for the Work and Materials," the Contractor shall protect concrete as provided in this Section 90-8.
- Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.
- Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.
- Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at the Contractor's expense.

90-8.02 PROTECTING CONCRETE STRUCTURES

- Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 7°C for 72 hours after placing and at not less than 4°C for an additional 4 days. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

90-8.03 PROTECTING CONCRETE PAVEMENT

- Pavement concrete shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.
- Except as provided in Section 7-1.08, "Public Convenience," the Contractor shall protect concrete pavement against construction and other activities that abrade, scar, discolor, reduce texture depth, lower coefficient of friction, or otherwise damage the surface. Stockpiling, drifting, or excessive spillage of soil, gravel, petroleum products, and concrete or asphalt mixes on the surface of concrete pavement is prohibited unless otherwise specified in these specifications, the special provisions or permitted by the Engineer.
- When ordered by the Engineer or shown on the plans or specified in the special provisions, pavement crossings shall be constructed for the convenience of public traffic. The material and work necessary for the construction of the crossings, and their subsequent removal and disposal, will be paid for at the contract unit prices for the items of work involved and if there are no contract items for the work involved, payment for pavement crossings will be made by extra work as provided in Section 4-1.03D, "Extra Work." Where public traffic will be required to cross over the new pavement, Type III portland cement may be used in concrete, if permitted in writing by the Engineer. The pavement may be opened to traffic as soon as the concrete has developed a modulus of rupture of 3.8 MPa. The modulus of rupture will be determined by California Test 523.
- No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement before a period of 10 days has elapsed after the concrete has been placed, nor before the concrete has developed a modulus of rupture of at least 3.8 MPa. Concrete that fails to attain a modulus of rupture of 3.8 MPa within 10 days shall not be opened to traffic until directed by the Engineer.
- Equipment for sawing weakened plane joints will be permitted on the pavement as specified in Section 40-1.08B, "Weakened Plane Joints."
- When requested in writing by the Contractor, the tracks on one side of paving equipment will be permitted on the pavement after a modulus of rupture of 2.4 MPa has been attained, provided that:
 - A. Unit pressure exerted on the pavement by the paver shall not exceed 135 kPa;
 - B. Tracks with cleats, grousers, or similar protuberances shall be modified or shall travel on planks or equivalent protective material, so that the pavement is not damaged; and
 - C. No part of the track shall be closer than 0.3-m from the edge of pavement.
- In case of visible cracking of, or other damage to the pavement, operation of the paving equipment on the pavement shall be immediately discontinued.
- Damage to the pavement resulting from early use of pavement by the Contractor's equipment as provided above shall be repaired by the Contractor at the Contractor's expense.
- The State will furnish the molds and machines for testing the concrete for modulus of rupture, and the Contractor, at the Contractor's expense, shall furnish the material and whatever labor the Engineer may require.

90-9 COMPRESSIVE STRENGTH

90-9.01 GENERAL

- Concrete compressive strength requirements consist of a minimum strength that shall be attained before various loads or stresses are applied to the concrete and, for concrete designated by strength, a minimum strength at the age of 28 days or at the age otherwise allowed in Section 90-1.01, "Description." The various strengths required are specified in these specifications or the special provisions or are shown on the plans.

- The compressive strength of concrete will be determined from test cylinders that have been fabricated from concrete sampled in conformance with the requirements of California Test 539. Test cylinders will be molded and initially field cured in conformance with California Test 540. Test cylinders will be cured and tested after receipt at the testing laboratory in conformance with the requirements of California Test 521. A strength test shall consist of the average strength of 2 cylinders fabricated from material taken from a single load of concrete, except that, if any cylinder should show evidence of improper sampling, molding, or testing, that cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

- When concrete compressive strength is specified as a prerequisite to applying loads or stresses to a concrete structure or member, test cylinders for other than steam cured concrete will be cured in conformance with Method 1 of California Test 540. The compressive strength of concrete determined for these purposes will be evaluated on the basis of individual tests.

- When concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete strength to be used as a basis for acceptance of other than steam cured concrete will be determined from cylinders cured in conformance with Method 1 of California Test 540. If the result of a single compressive strength test at the maximum age specified or allowed is below the specified strength but is 95 percent or more of the specified strength, the Contractor shall, at the Contractor's expense, make corrective changes, subject to approval of the Engineer, in the mix proportions or in the concrete fabrication procedures, before placing additional concrete, and shall pay to the State \$14 for each in-place cubic meter of concrete represented by the deficient test. If the result of a single compressive strength test at the maximum age specified or allowed is below 95 percent of the specified strength, but is 85 percent or more of the specified strength, the Contractor shall make the corrective changes specified above, and shall pay to the State \$20 for each in place cubic meter of concrete represented by the deficient test. In addition, such corrective changes shall be made when the compressive strength of concrete tested at 7 days indicates, in the judgment of the Engineer, that the concrete will not attain the required compressive strength at the maximum age specified or allowed. Concrete represented by a single test that indicates a compressive strength of less than 85 percent of the specified 28-day compressive strength will be rejected in conformance with the provisions in Section 6-1.04, "Defective Materials."

- If the test result indicates that the compressive strength at the maximum curing age specified or allowed is below the specified strength, but is 85 percent or more of the specified strength, payments to the State as required above shall be made, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. If the test result indicates a compressive strength at the maximum curing age specified or allowed below 85 percent, the concrete represented by that test will be rejected, unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable. If the evidence consists of tests made on cores taken from the work, the cores shall be obtained and tested in conformance with the requirements in ASTM Designation: C 42.

- No single compressive strength test shall represent more than 250 m³.

- When a precast concrete member is steam cured, the compressive strength of the concrete will be determined from test cylinders that have been handled and stored in conformance with Method 3 of California Test 540. The compressive strength of steam cured concrete will be evaluated on the basis of individual tests representing specific portions of production. When the concrete is designated by 28-day compressive strength rather than by cementitious material content, the concrete shall be considered to be acceptable whenever its compressive strength reaches the specified 28-day compressive strength provided that strength is reached in not more than the maximum number of days specified or allowed after the member is cast.

- When concrete is specified by compressive strength, prequalification of materials, mix proportions, mixing equipment, and procedures proposed for use will be required prior to placement of the concrete. Prequalification shall be accomplished by the submission of acceptable certified test data or trial batch reports by the Contractor. Prequalification data shall be based on the use of materials, mix proportions, mixing equipment, procedures, and size of batch proposed for use in the work.

- Certified test data, in order to be acceptable, shall indicate that not less than 90 percent of at least 20 consecutive tests exceed the specified strength at the maximum number of cure days specified or allowed, and none of those tests are less than 95 percent of specified strength. Strength tests included in the data shall be the most recent tests made on concrete of the proposed mix design and all shall have been made within one year of the proposed use of the concrete.

- Trial batch test reports, in order to be acceptable, shall indicate that the average compressive strength of 5 consecutive concrete cylinders, taken from a single batch, at not more than 28 days (or the maximum age allowed) after molding shall be at least 4 MPa greater than the specified 28-day compressive strength, and no individual cylinder shall have a strength less than the specified strength at the maximum age specified or allowed. Data contained in the report shall be from trial batches that were produced within one year of the proposed use of specified strength concrete in the project. Whenever air-entrainment is required, the air content of trial batches shall be equal to or greater than the air content specified for the concrete without reduction due to tolerances.

- Tests shall be performed in conformance with either the appropriate California Test methods or the comparable ASTM test methods. Equipment employed in testing shall be in good condition and shall be properly calibrated. If the tests are performed during the life of the contract, the Engineer shall be notified sufficiently in advance of performing the tests in order to witness the test procedures.

- The certified test data and trial batch test reports shall include the following information:

- A. Date of mixing.
- B. Mixing equipment and procedures used.
- C. The size of batch in cubic meters and the mass, type, and source of all ingredients used.
- D. Penetration of the concrete.
- E. The air content of the concrete if an air-entraining admixture is used.
- F. The age at time of testing and strength of all concrete cylinders tested.

- Certified test data and trial batch test reports shall be signed by an official of the firm that performed the tests.

- When approved by the Engineer, concrete from trial batches may be used in the work at locations where concrete of a lower quality is required and the concrete will be paid for as the type or class of concrete required at that location.

- After materials, mix proportions, mixing equipment, and procedures for concrete have been prequalified for use, additional prequalification by testing of trial batches will be required prior to making changes that, in the judgment of the Engineer, could result in a strength of concrete below that specified.

- The Contractor's attention is directed to the time required to test trial batches and the Contractor shall be responsible for production of trial batches at a sufficiently early date so that the progress of the work is not delayed.

- When precast concrete members are manufactured at the plant of an established manufacturer of precast concrete members, the mix proportions of the concrete shall be determined by the Contractor, and a trial batch and prequalification of the materials, mix proportions, mixing equipment, and procedures will not be required.

90-10 MINOR CONCRETE

90-10.01 GENERAL

- Concrete for minor structures, slope paving, curbs, sidewalks and other concrete work, when designated as minor concrete on the plans, in the specifications, or in the contract item, shall conform to the provisions specified herein.

- The Engineer, at the Engineer's discretion, will inspect and test the facilities, materials and methods for producing the concrete to ensure that minor concrete of the quality suitable for use in the work is obtained.

90-10.02 MATERIALS

- Minor concrete shall conform to the following requirements:

90-10.02A Cementitious Material

- Cementitious material shall conform to the provisions in Section 90-1.01, "Description."

90-10.02B Aggregate

- Aggregate shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.

- The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the minor concrete. After acceptance of the grading, aggregate furnished for minor concrete shall conform to that grading, unless a change is authorized in writing by the Engineer.

- The Engineer may require the Contractor to furnish periodic test reports of the aggregate grading furnished. The maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 37.5 mm or smaller than 19 mm.

- The Engineer may waive, in writing, the gradation requirements in this Section 90-10.02B, if, in the Engineer's opinion, the furnishing of the gradation is not necessary for the type or amount of concrete work to be constructed.

90-10.02C Water

- Water used for washing, mixing, and curing shall be free from oil, salts, and other impurities that would discolor or etch the surface or have an adverse affect on the quality of the concrete.

90-10.02D Admixtures

- The use of admixtures shall conform to the provisions in Section 90-4, "Admixtures."

90-10.03 PRODUCTION

- Cementitious material, water, aggregate, and admixtures shall be stored, proportioned, mixed, transported, and discharged in conformance with recognized standards of good practice that will result in concrete that is thoroughly and uniformly mixed, that is suitable for the use intended, and that conforms to requirements specified herein. Recognized standards of good practice are outlined in various industry publications such as are issued by American Concrete Institute, AASHTO, or the Department.

- The cementitious material content of minor concrete shall conform to the provisions in Section 90-1.01, "Description."

- The amount of water used shall result in a consistency of concrete conforming to the provisions in Section 90-6.06, "Amount of Water and Penetration." Additional mixing water shall not be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer.

- Discharge of ready-mixed concrete from the transporting vehicle shall be made while the concrete is still plastic and before stiffening occurs. An elapsed time of 1.5 hours (one hour in non-agitating hauling equipment), or more than 250 revolutions of the drum or blades, after the introduction of the cementitious material to the aggregates, or a temperature of concrete of more than 32°C will be considered conditions contributing to the quick stiffening of concrete. The Contractor shall take whatever action is necessary to eliminate quick stiffening, except that the addition of water will not be permitted.

- The required mixing time in stationary mixers shall be not less than 50 seconds or more than 5 minutes.

- The minimum required revolutions at mixing speed for transit-mixed concrete shall be not less than that recommended by the mixer manufacturer, and shall be increased, if necessary, to produce thoroughly and uniformly mixed concrete.

- Each load of ready-mixed concrete shall be accompanied by a weighmaster certificate that shall be delivered to the Engineer at the discharge location of the concrete, unless otherwise directed by the Engineer. The weighmaster certificate shall be clearly marked with the date and time of day when the load left the batching plant and, if hauled in truck mixers or agitators, the time the mixing cycle started.

- A Certificate of Compliance conforming to the provisions in Section 6-1.07, "Certificates of Compliance," shall be furnished to the Engineer, prior to placing minor concrete from a source not previously used on the contract, stating that minor concrete to be furnished meets contract requirements, including minimum cementitious material content specified.

90-10.04 CURING MINOR CONCRETE

- Curing minor concrete shall conform to the provisions in Section 90-7, "Curing Concrete."

90-10.05 PROTECTING MINOR CONCRETE

- Protecting minor concrete shall conform to the provisions in Section 90-8, "Protecting Concrete," except the concrete shall be maintained at a temperature of not less than 4°C for 72 hours after placing.

90-10.06 MEASUREMENT AND PAYMENT

- Minor concrete will be measured and paid for in conformance with the provisions specified in the various sections of these specifications covering concrete construction when minor concrete is specified in the specifications, shown on the plans, or indicated by contract item in the Engineer's Estimate.

90-11 MEASUREMENT AND PAYMENT

90-11.01 MEASUREMENT

- Portland cement concrete will be measured in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.

- When it is provided that concrete will be measured at the mixer, the volume in cubic meters shall be computed as the total mass of the batch in kilograms divided by the density of the concrete in kilograms per cubic meter. The total mass of the batch shall be calculated as the sum of all materials, including water, entering the batch. The density of the concrete will be determined in conformance with the requirements in California Test 518.

90-11.02 PAYMENT

- Portland cement concrete will be paid for in conformance with the provisions specified in the various sections of these specifications covering construction requiring concrete.
- Full compensation for furnishing and incorporating admixtures required by these specifications or the special provisions will be considered as included in the contract prices paid for the concrete involved and no additional compensation will be allowed therefor.
- Should the Engineer order the Contractor to incorporate any admixtures in the concrete when their use is not required by these specifications or the special provisions, furnishing the admixtures and adding them to the concrete will be paid for as extra work as provided in Section 4-1.03D, "Extra Work."
- Should the Contractor use admixtures in conformance with the provisions in Section 90-4.05, "Optional Use of Chemical Admixtures," or Section 90-4.07, "Optional Use of Air-entraining Admixtures," or should the Contractor request and obtain permission to use other admixtures for the Contractor's benefit, the Contractor shall furnish those admixtures and incorporate them into the concrete at the Contractor's expense and no additional compensation will be allowed therefor.

END OF AMENDMENTS

SECTION 2. PROPOSAL REQUIREMENTS AND CONDITIONS

2-1.01 GENERAL

The bidder's attention is directed to the provisions in Section 2, "Proposal Requirements and Conditions," of the Standard Specifications and these special provisions for the requirements and conditions which the bidder must observe in the preparation of the proposal form and the submission of the bid.

In addition to the subcontractors required to be listed in conformance with Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications, each proposal shall have listed therein the name and address of each DVBE subcontractor to be used for credit in meeting the goal, and to whom the bidder proposes to directly subcontract portions of the work. The list of subcontractors shall also set forth the portion of work that will be performed by each subcontractor listed. A sheet for listing the subcontractors is included in the Proposal.

The Bidder's Bond form mentioned in the last paragraph in Section 2-1.07, "Proposal Guaranty," of the Standard Specifications will be found following the signature page of the Proposal.

Submit request for substitution of an "or equal" item, and the data substantiating the request to the Department of Transportation, Division Of Construction - Duty Senior, Mail Station: 3 - B, 111 Grand Avenue / P. O. Box 23660, Oakland, CA 94623-0660, so that the request is received by the Department by close of business on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening.

In conformance with Public Contract Code Section 7106, a Noncollusion Affidavit is included in the Proposal. Signing the Proposal shall also constitute signature of the Noncollusion Affidavit.

Failure of the bidder to fulfill the requirements of the Special Provisions for submittals required to be furnished after bid opening, including but not limited to DBE or DVBE submittals, or escrowed bid documents, where applicable, may subject the bidder to a determination of the bidder's responsibility in the event it is the apparent low bidder on a future public works contracts.

2-1.02 DISABLED VETERAN BUSINESS ENTERPRISE (DVBE)

Section 10115 of the Public Contract Code requires the Department to implement provisions to establish a goal for Disabled Veteran Business Enterprise (DVBE) in contracts.

It is the policy of the Department that Disabled Veteran Business Enterprise (DVBE) shall have the maximum opportunity to participate in the performance of contracts financed solely with state funds. The Contractor shall ensure that DVBEs have the maximum opportunity to participate in the performance of this contract and shall take all necessary and reasonable steps for this assurance. The Contractor shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of subcontracts. Failure to carry out the requirements of this paragraph shall constitute a breach of contract and may result in termination of this contract or other remedy the Department may deem appropriate.

Bidder's attention is directed to the following:

- A. "Disabled Veteran Business Enterprise" (DVBE) means a business concern certified as a DVBE by the Office of Small Business and Disabled Veteran Business Enterprise Certification, Department of General Services.
- B. A DVBE may participate as a prime contractor, subcontractor, joint venture partner with a prime or subcontractor, or vendor of material or supplies.
- C. Credit for DVBE prime contractors will be 100 percent.

- D. A DVBE joint venture partner must be responsible for specific contract items of work, or portions thereof. Responsibility means actually performing, managing and supervising the work with its own forces. The DVBE joint venture partner must share in the ownership, control, management responsibilities, risks and profits of the joint venture. The DVBE joint venturer must submit the joint venture agreement with the Caltrans Bidder DVBE Information form required in Section 2-1.04, "Submission of DVBE Information," elsewhere in these special provisions.
- E. A DVBE must perform a commercially useful function, i.e., must be responsible for the execution of a distinct element of the work and must carry out its responsibility by actually performing, managing and supervising the work.
- F. Credit for DVBE vendors of materials or supplies is limited to 60 percent of the amount to be paid to the vendor for the material unless the vendor manufactures or substantially alters the goods.
- G. Credit for trucking by DVBEs will be as follows:
 - 1. One hundred percent of the amount to be paid when a DVBE trucker will perform the trucking with his/her own trucks, tractors and employees.
 - 2. Twenty percent of the amount to be paid to DVBE trucking brokers who do not have a "certified roster."
 - 3. One hundred percent of the amount to be paid to DVBE trucking brokers who have signed agreements that all trucking will be performed by DVBE truckers if credit is toward the DVBE goal, a "certified roster" showing that all trucks are owned by DVBEs, and a signed statement on the "certified roster" that indicates that 100 percent of revenue paid by the broker will be paid to the DVBEs listed on the "certified roster."
 - 4. Twenty percent of the amount to be paid to trucking brokers who are not a DVBE but who have signed agreements with DVBE truckers assuring that at least 20 percent of the trucking will be performed by DVBE truckers if credit is toward the DVBE goal, a "certified roster" showing that at least 20 percent of the number of trucks are owned by DVBE truckers, and a signed statement on the "certified roster" that indicates that at least 20 percent of the revenue paid by the broker will be paid to the DVBEs listed on the "certified roster."

The "certified roster" referred to herein shall conform to the requirements in Section 2-1.04, "Submission Of DVBE Information," elsewhere in these special provisions.

- H. DVBEs and DVBE joint venture partners must be certified DVBEs as determined by the Department of General Services, Office of Small Business and Disabled Veteran Business Enterprise Certification, 707 Third Street, West Sacramento, CA 95605, on the date bids for the project are opened before credit may be allowed toward the DVBE goal. It is the Contractor's responsibility to verify that DVBEs are certified.
- I. Noncompliance by the Contractor with these requirements constitutes a breach of this contract and may result in termination of the contract or other appropriate remedy for a breach of this contract.

2-1.03 DVBE GOAL FOR THIS PROJECT

The Department has established the following goal for Disabled Veteran Business Enterprise (DVBE) participation for this project:

Disabled Veteran Business Enterprise (DVBE): 3 percent.

It is the bidder's responsibility to make a sufficient portion of the work available to subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DVBE subcontractors and suppliers, so as to assure meeting the goal for DVBE participation.

The Office of Small Business and Disabled Veteran Business Enterprise Certification, Department of General Services, may be contacted at (800) 559-5529 or (916) 375-4940 or visit their internet web site at <http://www.pd.dgs.ca.gov/smbus/default.htm> for program information and certification status. The Department's Business Enterprise Program may also be contacted through their internet web site at <http://www.dot.ca.gov/hq/bep/> or at (866) 810-6346 or (916) 324-1700.

2-1.04 SUBMISSION OF DVBE INFORMATION

The required DVBE information shall be submitted on the "CALTRANS BIDDER - DVBE INFORMATION" form included in the Proposal. If this information is not submitted with the bid, the DVBE information forms shall be removed from the documents prior to submitting the bid.

It is the bidder's responsibility to make enough work available to DVBEs and to select those portions of the work or material needs consistent with the available DVBEs to meet the goal for DVBE participation or to provide information to establish that, prior to bidding, the bidder made adequate good faith efforts to do so.

If the DVBE information is not submitted with the bid, the apparent successful bidder (low bidder), the second low bidder and the third low bidder shall submit the DVBE information to the Department of Transportation, 1120 N Street, Room 0200, MS #26, Sacramento, California 95814 so the information is received by the Department no later than 4:00 p.m. on the fourth day, not including Saturdays, Sundays and legal holidays, following bid opening. DVBE information sent by U.S. Postal Service certified mail with return receipt and certificate of mailing and mailed on or before the third day, not including Saturdays, Sundays and legal holidays, following bid opening will be accepted even if it is received after the fourth day following bid opening. Failure to submit the required DVBE information by the time specified will be grounds for finding the bid or proposal nonresponsive. Other bidders need not submit DVBE information unless requested to do so by the Department.

The bidder's DVBE information shall establish that good faith efforts to meet the DVBE goal have been made. To establish good faith efforts, the bidder shall demonstrate that the goal will be met or that, prior to bidding, adequate good faith efforts to meet the goal were made.

Bidders are cautioned that even though their submittal indicates they will meet the stated DVBE goal, their submittal should also include their adequate good faith efforts information along with their DVBE goal information to protect their eligibility for award of the contract in the event the Department, in its review, finds that the goal has not been met.

The bidder's DVBE information shall include the names of DVBE firms that will participate, with a complete description of work or supplies to be provided by each, the dollar value of each DVBE transaction, and a written confirmation from the DVBE that it is participating in the contract. A copy of the DVBE's quote will serve as written confirmation that the DVBE is participating in the contract. When 100 percent of a contract item of work is not to be performed or furnished by a DVBE, a description of the exact portion of that work to be performed or furnished by that DVBE shall be included in the DVBE information, including the planned location of that work. The work that a DVBE prime contractor has committed to performing with its own forces as well as the work that it has committed to be performed by DVBE subcontractors, suppliers and trucking companies will count toward the goal.

If credit for trucking by a DVBE trucking broker is shown on the bidder's information as 100 percent of the revenue to be paid by the broker is to be paid to DVBE truckers, a "certified roster" of the broker's trucks to be used must be included. The "certified roster" must indicate that all the trucks are owned by certified DVBEs and must show the DVBE truck numbers, owner's name, Public Utilities Commission Cal-T numbers, and the DVBE certification numbers. The roster must indicate that all revenue paid by the broker will be paid to DVBEs listed on the "certified roster".

If credit for trucking by a trucking broker who is not a DVBE is shown in the bidder's information, a "certified roster" of the broker's trucks to be used must be included. The "certified roster" must indicate that at least 20 percent of the broker's trucks are owned by certified DVBEs and must show the DVBE truck numbers, owner's name, Public Utilities Commission Cal-T numbers, and the DVBE certification number. The roster must indicate that at least 20 percent of the revenue paid by the broker will be paid to DVBEs listed on the "certified roster".

A bidder shall be deemed to have made good faith efforts upon submittal, within time limits specified by the Department, of documentary evidence that all of the following actions were taken:

- A. Contact was made with the Office of Small Business and Disabled Veteran Business Enterprise Certification (OSDC), Department of General Services or their web site at <http://www.pd.dgs.ca.gov/smbus/default.htm> to identify Disabled Veteran Business Enterprises.
- B. Advertising was published in trade media and media focusing on Disabled Veteran Business Enterprises, unless time limits imposed by the Department do not permit that advertising.
- C. Invitations to bid were submitted to potential Disabled Veteran Business Enterprise contractors.
- D. Available Disabled Veteran Business Enterprises were considered.

2-1.05 SMALL BUSINESS PREFERENCE

Attention is directed to "Award and Execution of Contract" of these special provisions.

Attention is also directed to the Small Business Procurement and Contract Act, Government Code Section 14835, et seq and Title 2, California Code of Regulations, Section 1896, et seq.

Bidders who wish to be classified as a Small Business under the provisions of those laws and regulations, shall be certified as Small Business by the Department of General Services, Office of Small Business and Disabled Veteran Business Enterprise Certification, 707 Third Street, West Sacramento, CA 95605.

To request Small Business Preference, bidders shall fill out and sign the Request for Small Business Preference form in the Proposal and shall attach a copy of their Office of Small Business and Disabled Veteran Business Enterprise Certification small business certification letter to the form. The bidder's signature on the Request for Small Business Preference certifies, under penalty of perjury, that the bidder is certified as Small Business at the time of bid opening and further certifies, under penalty of perjury, that under the following conditions, at least 50 percent of the subcontractors to be utilized on the project are either certified Small Business or have applied for Small Business certification by bid opening date and are subsequently granted Small Business certification.

The conditions requiring the aforementioned 50 percent level of subcontracting by Small Business subcontractors apply if:

- A. The lowest responsible bid for the project exceeds \$100,000; and
- B. The project work to be performed requires a Class A or a Class B contractor's license; and
- C. Two or more subcontractors will be used.

If the above conditions apply and Small Business Preference is granted in the award of the contract, the 50 percent Small Business subcontractor utilization level shall be maintained throughout the life of the contract.

2-1.06 CALIFORNIA COMPANY PREFERENCE

Attention is directed to "Award and Execution of Contract" of these special provisions.

In conformance with the requirements of Section 6107 of the Public Contract Code, a "California company" will be granted a reciprocal preference for bid comparison purposes as against a nonresident contractor from any state that gives or requires a preference to be given contractors from that state on its public entity construction contracts.

A "California company" means a sole proprietorship, partnership, joint venture, corporation, or other business entity that was a licensed California contractor on the date when bids for the public contract were opened and meets one of the following:

- A. Has its principal place of business in California.
- B. Has its principal place of business in a state in which there is no local contractor preference on construction contracts.
- C. Has its principal place of business in a state in which there is a local contractor construction preference and the contractor has paid not less than \$5000 in sales or use taxes to California for construction related activity for each of the five years immediately preceding the submission of the bid.

To carry out the "California company" reciprocal preference requirements of Section 6107 of the Public Contract Code, all bidders shall fill out and sign the California Company Preference form in the Proposal. The bidder's signature on the California Company Preference form certifies, under penalty of perjury, that the bidder is or is not a "California company" and if not, the amount of the preference applied by the state of the nonresident Contractor.

A nonresident Contractor shall disclose any and all bid preferences provided to the nonresident Contractor by the state or country in which the nonresident Contractor has its principal place of business.

Proposals without the California Company Preference form filled out and signed may be rejected.

SECTION 3. AWARD AND EXECUTION OF CONTRACT

The bidder's attention is directed to the provisions in Section 3, "Award and Execution of Contract," of the Standard Specifications and these special provisions for the requirements and conditions concerning award and execution of contract.

Bid protests are to be delivered to the following address: Department of Transportation, MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816 or by facsimile to the Office Engineer at (916) 227-6282.

The award of the contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed and who has met the goal for DVBE participation or has demonstrated, to the satisfaction of the Department, adequate good faith efforts to do so. Meeting the goal for DVBE participation or demonstrating, to the satisfaction of the Department, adequate good faith efforts to do so is a condition for being eligible for award of contract.

The contract shall be executed by the successful bidder and shall be returned, together with the contract bonds, to the Department so that it is received within 10 days, not including Saturdays, Sundays and legal holidays, after the bidder has received the contract for execution. Failure to do so shall be just cause for forfeiture of the proposal guaranty. The executed contract documents shall be delivered to the following address: Department of Transportation MS 43, Attn: Office Engineer, 1727 30th Street, Sacramento, CA 95816.

A "Payee Data Record" form will be included in the contract documents to be executed by the successful bidder. The purpose of the form is to facilitate the collection of taxpayer identification data. The form shall be completed and returned to the Department by the successful bidder with the executed contract and contract bonds. For the purposes of the form, payee shall be deemed to mean the successful bidder. The form is not to be completed for subcontractors or suppliers. Failure to complete and return the "Payee Data Record" form to the Department as provided herein will result in the retention of 20 percent of payments due the contractor and penalties of up to \$20,000. This retention of payments for failure to complete the "Payee Data Record" form is in addition to any other retention of payments due the Contractor.

Attention is also directed to "Small Business Preference" of these special provisions. Any bidder who is certified as a Small Business by the Department of General Services, Office of Small Business and Disabled Veteran Business Enterprise Certification, will be allowed a preference in the award of this contract, if it be awarded, under the following conditions:

- A. The apparent low bidder is not certified as a Small Business, or has not filled out and signed the Request for Small Business Preference included with the bid documents and attached a copy of their Office of Small Business and Disabled Veteran Business Enterprise Certification small business certification letter to the form; and
- B. The bidder filled out and signed the Request for Small Business Preference form included with the bid documents and attached a copy of their Office of Small Business and Disabled Veteran Business Enterprise Certification small business certification letter to the form.

The small business preference will be a reduction in the bid submitted by the small business contractor, for bid comparison purposes, by an amount equal to 5 percent of the amount bid by the apparent low bidder, the amount not to exceed \$50,000. If this reduction results in the small business contractor becoming the low bidder, then the contract will be awarded to the small business contractor on the basis of the actual bid of the small business contractor notwithstanding the reduced bid price used for bid comparison purposes.

Attention is also directed to "California Company Preference" of these special provisions.

The amount of the California company reciprocal preference shall be equal to the amount of the preference applied by the state of the nonresident contractor with the lowest responsive bid, except where the "California company" is eligible for a California Small Business Preference, in which case the preference applied shall be the greater of the two, but not both.

If the bidder submitting the lowest responsive bid is not a "California company" and with the benefit of the reciprocal preference, a "California company's" responsive bid is equal to or less than the original lowest responsive bid, the "California company" will be awarded the contract at its submitted bid price except as provided below.

Small business bidders shall have precedence over nonsmall business bidders in that the application of the "California company" preference for which nonsmall business bidders may be eligible shall not result in the denial of the award to a small business bidder.

SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION AND LIQUIDATED DAMAGES

Attention is directed to the provisions in Sections 8-1.03, "Beginning of Work," 8-1.06, "Time of Completion," 8-1.07, "Liquidated Damages," and 20-4.08, "Plant Establishment Work," of the Standard Specifications and these special provisions.

The Contractor shall begin work within 15 calendar days after the contract has been approved by the Attorney General or the attorney appointed and authorized to represent the Department of Transportation.

The work shall be diligently prosecuted to completion before the expiration of **360 WORKING DAYS** beginning on the fifteenth calendar day after approval of the contract.

The Contractor shall pay to the State of California the sum of **\$5000** per day, for each and every calendar day's delay in finishing the work in excess of **360 WORKING DAYS**.

The Contractor shall diligently prosecute all work (including plant establishment) to completion before the expiration of **360 WORKING DAYS** beginning on the fifteenth calendar day after approval of the contract.

The Contractor shall pay to the State of California the sum of **\$5000** per day, for each and every calendar day's delay in completing the work in excess of **360 WORKING DAYS**.

In no case will liquidated damages of more than **\$5000** per day be assessed.

SECTION 5. GENERAL

SECTION 5-1. MISCELLANEOUS

5-1.01 PLANS AND WORKING DRAWINGS

When the specifications require working drawings to be submitted to the Division of Structure Design, the drawings shall be submitted to: Division of Structure Design, Documents Unit, Mail Station 9, 1801 30th Street, Sacramento, CA 95816, Telephone 916 227-8252.

5-1.011 EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK

Attention is directed to "Differing Site Conditions" of these special provisions regarding physical conditions at the site which may differ from those indicated in "Materials Information," log of test borings or other geotechnical information obtained by the Department's investigation of site conditions.

5-1.012 DIFFERING SITE CONDITIONS

Attention is directed to Section 5-1.116, "Differing Site Conditions," of the Standard Specifications.

During the progress of the work, if subsurface or latent conditions are encountered at the site differing materially from those indicated in the "Materials Information," log of test borings, other geotechnical data obtained by the Department's investigation of subsurface conditions, or an examination of the conditions above ground at the site, the party discovering those conditions shall promptly notify the other party in writing of the specific differing conditions before they are disturbed and before the affected work is performed.

The Contractor will be allowed 15 days from the notification of the Engineer's determination of whether or not an adjustment of the contract is warranted, in which to file a notice of potential claim in conformance with the provisions of Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and as specified herein; otherwise the decision of the Engineer shall be deemed to have been accepted by the Contractor as correct. The notice of potential claim shall set forth in what respects the Contractor's position differs from the Engineer's determination and provide any additional information obtained by the Contractor, including but not limited to additional geotechnical data. The notice of potential claim shall be accompanied by the Contractor's certification that the following were made in preparation of the bid: a review of the contract, a review of the "Materials Information," a review of the log of test borings and other records of geotechnical data to the extent they were made available to bidders prior to the opening of bids, and an examination of the conditions above ground at the site. Supplementary information, obtained by the Contractor subsequent to the filing of the notice of potential claim, shall be submitted to the Engineer in an expeditious manner.

5-1.013 LINES AND GRADES

Attention is directed to Section 5-1.07, "Lines and Grades," of the Standard Specifications.

Stakes or marks will be set by the Engineer in conformance with the requirements in Chapter 12, "Construction Surveys," of the Department's Surveys Manual.

5-1.015 LABORATORY

When a reference is made in the specifications to the "Laboratory," the reference shall mean Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services of the Department of Transportation, or established laboratories of the various Districts of the Department, or other laboratories authorized by the Department to test materials and work involved in the contract. When a reference is made in the specifications to the "Transportation Laboratory," the reference shall mean Division of Engineering Services - Materials Engineering and Testing Services and Division of Engineering Services - Geotechnical Services, located at 5900 Folsom Boulevard, Sacramento, CA 95819, Telephone (916) 227-7000.

5-1.017 CONTRACT BONDS

Attention is directed to Section 3-1.02, "Contract Bonds," of the Standard Specifications and these special provisions.

The payment bond shall be in a sum not less than one hundred percent of the total amount payable by the terms of the contract.

5-1.018 GUARANTEE

GENERAL

The Contractor shall guarantee the work is in accordance with contract requirements and remains free from substantial defects in materials and workmanship for a period of one year after contract acceptance. For certain portions of the work where the Director relieves the Contractor of responsibility in accordance with Section 7-1.15, "Relief from Maintenance and Responsibility," of the Standard Specifications, the guarantee period starts on the relief date and ends one year therefrom.

Substantial defects in materials and workmanship means defective work objectively manifested by damaged, displaced, or missing parts or components; and workmanship resulting in improper function of materials, components, equipment, or systems, as installed or manufactured by the Contractor, subcontractor, supplier, or manufacturer.

During the guarantee period, the Contractor shall repair or replace contract work and associated work which is not in accordance with contract requirements or has substantial defects in materials and workmanship. The Contractor shall perform the corrective work with no expense to the Department other than State-provided field inspection services.

The guarantee of work excludes damage or displacement that is outside the control of the Contractor and caused by normal wear and tear, improper operation, insufficient maintenance, abuse, unauthorized modification, or natural disaster as described in Section 7-1.165, "Damage by Storm, Flood, Tsunami or Earthquake," of the Standard Specifications.

The Contractor shall have the same insurance coverage during corrective work operations as prior to contract acceptance, in accordance with Section 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The contract bonds furnished in accordance with Section 3-1.02, "Contract Bonds," of the Standard Specifications must remain in full force and effect during the guarantee period and until all corrective work is complete.

In the case of conflict between this guarantee provision and any warranty provision included in the contract, the warranty provision shall govern for the specific construction product or feature covered.

CORRECTIVE WORK

During the guarantee period, the Department will monitor performance of the highway facilities completed by the Contractor and will perform a thorough review of the contract work at least 60 days before the expiration of the one-year guarantee.

If the Engineer discovers contract work not in compliance with contract requirements or that has substantial defects in materials and workmanship, at any time during the guarantee period, a list of items that require corrective work will be developed and forwarded to the Contractor. Within 15 days of receipt of a list, the Contractor shall submit to the Engineer a detailed plan for performing corrective work. The work plan shall include a start to finish schedule. It shall include a list of labor, equipment, materials, and any special services intended to be used. It shall clearly show related work including traffic control, temporary delineation, and permanent delineation.

The Contractor shall start the corrective and related work within 15 days of receiving notice from the Engineer that the Contractor's work plan is approved. The corrective work shall be diligently prosecuted and completed within the time allotted in the approved work plan.

If the Engineer determines that corrective work, covered by the guarantee, is urgently needed to prevent injury or property damage, the Engineer will give the Contractor a request to start emergency repair work and a list of items that require repair work. The Contractor shall mobilize within 24 hours and diligently perform emergency repair work on the damaged highway facilities. The Contractor shall submit a work plan within 5 days of starting emergency repair work.

If the Contractor fails to commence and execute, with due diligence, corrective work and related work required under the guarantee in the time allotted, the Engineer may proceed to have the work performed by State forces or other forces at the Contractor's expense. Upon demand, the Contractor shall pay all costs incurred by the Department for work performed by State forces or other forces including labor, equipment, material, and special services.

PAYMENT

Full compensation for performing corrective work; and related work such as traffic control, temporary delineation, and permanent delineation, and to maintain insurance coverage and bonds, shall be considered as included in the contract prices paid for the various contract items of work and no separate payment will be made therefore.

5-1.019 COST REDUCTION INCENTIVE

Attention is directed to Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

Prior to preparing a written cost reduction proposal, the Contractor shall request a meeting with the Engineer to discuss the proposal in concept. Items of discussion will also include permit issues, impact on other projects, impact on the project schedule, peer reviews, overall merit of the proposal, and review times required by the Department and other agencies.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in contract time, 50 percent of that contract time reduction shall be credited to the State by reducing the contract working days, not including plant establishment. Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions regarding the working days.

If a cost reduction proposal submitted by the Contractor, and subsequently approved by the Engineer, provides for a reduction in traffic congestion or avoids traffic congestion during construction, 60 percent of the estimated net savings in construction costs attributable to the cost reduction proposal will be paid to the Contractor. In addition to the requirements in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications, the Contractor shall provide detailed comparisons of the traffic handling between the existing contract and the proposed change, and estimates of the traffic volumes and congestion.

5-1.02 LABOR NONDISCRIMINATION

Attention is directed to the following Notice that is required by Chapter 5 of Division 4 of Title 2, California Code of Regulations.

NOTICE OF REQUIREMENT FOR NONDISCRIMINATION PROGRAM

(GOV. CODE, SECTION 12990)

Your attention is called to the "Nondiscrimination Clause", set forth in Section 7-1.01A(4), "Labor Nondiscrimination," of the Standard Specifications, which is applicable to all nonexempt State contracts and subcontracts, and to the "Standard California Nondiscrimination Construction Contract Specifications" set forth therein. The specifications are applicable to all nonexempt State construction contracts and subcontracts of \$5000 or more.

5-1.022 PAYMENT OF WITHHELD FUNDS

Payment of withheld funds shall conform to Section 9-1.065, "Payment of Withheld Funds," of the Standard Specifications and these special provisions.

Funds withheld from progress payments to ensure performance of the contract that are eligible for payment into escrow or to an escrow agent pursuant to Section 10263 of the California Public Contract Code do not include funds withheld or deducted from payment due to failure of the Contractor to fulfill a contract requirement.

5-1.03 INTEREST ON PAYMENTS

Interest shall be payable on progress payments, payments after acceptance, final payments, extra work payments, and claim payments as follows:

- A. Unpaid progress payments, payment after acceptance, and final payments shall begin to accrue interest 30 days after the Engineer prepares the payment estimate.
- B. Unpaid extra work bills shall begin to accrue interest 30 days after preparation of the first pay estimate following receipt of a properly submitted and undisputed extra work bill. To be properly submitted, the bill must be submitted within 7 days of the performance of the extra work and in conformance with the provisions in Section 9-1.03C, "Records," and Section 9-1.06, "Partial Payments," of the Standard Specifications. An undisputed extra work bill not submitted within 7 days of performance of the extra work will begin to accrue interest 30 days after the preparation of the second pay estimate following submittal of the bill.
- C. The rate of interest payable for unpaid progress payments, payments after acceptance, final payments, and extra work payments shall be 10 percent per annum.
- D. The rate of interest payable on a claim, protest or dispute ultimately allowed under this contract shall be 6 percent per annum. Interest shall begin to accrue 61 days after the Contractor submits to the Engineer information in sufficient detail to enable the Engineer to ascertain the basis and amount of said claim, protest or dispute.

The rate of interest payable on any award in arbitration shall be 6 percent per annum if allowed under the provisions of Civil Code Section 3289.

5-1.04 PUBLIC SAFETY

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications and these special provisions.

The Contractor shall install temporary railing (Type K) between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

- A. Excavations.—The near edge of the excavation is 3.6 m or less from the edge of the lane, except:
 - 1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
 - 2. Excavations less than 0.3-m deep.
 - 3. Trenches less than 0.3-m wide for irrigation pipe or electrical conduit, or excavations less than 0.3-m in diameter.
 - 4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
 - 5. Excavations in side slopes, where the slope is steeper than 1:4 (vertical:horizontal).
 - 6. Excavations protected by existing barrier or railing.
- B. Temporarily Unprotected Permanent Obstacles.—The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor's convenience and with permission of the Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.
- C. Storage Areas.—Material or equipment is stored within 3.6 m of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these special provisions.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.09, "Public Safety," of the Standard Specifications, shall be offset a minimum of 4.6 m from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than 0.3-m transversely to 3 m longitudinally with respect to the edge of the traffic lane. If the 4.6-m minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum

available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

Temporary railing (Type K) shall conform to the provisions in Section 12-3.08, "Temporary Railing (Type K)," of the Standard Specifications. Temporary railing (Type K), conforming to the details shown on 1999 Standard Plan T3, may be used. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Temporary crash cushion modules shall conform to the provisions in "Temporary Crash Cushion Module" of these special provisions.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane unless otherwise provided in the Standard Specifications and these special provisions:

Approach Speed of Public Traffic (Posted Limit) (Kilometers Per Hour)	Work Areas
Over 72 (45 Miles Per Hour)	Within 1.8 m of a traffic lane but not on a traffic lane
56 to 72 (35 to 45 Miles Per Hour)	Within 0.9-m of a traffic lane but not on a traffic lane

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 3 m without written approval from the Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

Full compensation for conforming to the provisions in this section "Public Safety," including furnishing and installing temporary railing (Type K) and temporary crash cushion modules, shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

5-1.05 TESTING

Testing of materials and work shall conform to the provisions in Section 6-3, "Testing," of the Standard Specifications and these special provisions.

Whenever the provisions of Section 6-3.01, "General," of the Standard Specifications refer to tests or testing, it shall mean tests to assure the quality and to determine the acceptability of the materials and work.

The Engineer will deduct the costs for testing of materials and work found to be unacceptable, as determined by the tests performed by the Department, and the costs for testing of material sources identified by the Contractor which are not used for the work, from moneys due or to become due to the Contractor. The amount deducted will be determined by the Engineer.

5-1.06 REMOVAL OF ASBESTOS AND HAZARDOUS SUBSTANCES

When the presence of asbestos or hazardous substances are not shown on the plans or indicated in the specifications and the Contractor encounters materials which the Contractor reasonably believes to be asbestos or a hazardous substance as defined in Section 25914.1 of the Health and Safety Code, and the asbestos or hazardous substance has not been rendered harmless, the Contractor may continue work in unaffected areas reasonably believed to be safe. The Contractor shall immediately cease work in the affected area and report the condition to the Engineer in writing.

In conformance with Section 25914.1 of the Health and Safety Code, removal of asbestos or hazardous substances including exploratory work to identify and determine the extent of the asbestos or hazardous substance will be performed by separate contract.

If delay of work in the area delays the current controlling operation, the delay will be considered a right of way delay and the Contractor will be compensated for the delay in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

5-1.065 SOLID WASTE DISPOSAL AND RECYCLING REPORT

This work shall consist of reporting disposal and recycling of construction solid waste, as specified in these special provisions. For the purposes of this section, solid waste includes construction and demolition waste debris, but not hazardous waste.

Annually by the fifteenth day of January, the Contractor shall complete and certify Form CEM-2025, "Solid Waste Disposal and Recycling Report," which quantifies solid waste generated by the work performed and disposed of in landfills or recycled during the previous calendar year. The amount and type of solid waste disposed of or recycled shall be reported in either metric tonnes or cubic meters. The Contractor shall also complete and certify Form CEM-2025 within 5 days following contract acceptance.

Form CEM-2025, "Solid Waste Disposal and Recycling Report" can be downloaded from the following website:

<http://www.dot.ca.gov/hq/construc/manual2001>

If the Contractor has not submitted Form CEM-2025, by the dates specified above, the Department will withhold the amount of \$10,000 for each missing or incomplete report. The moneys withheld will be released for payment on the next monthly estimate for partial payment following the date that a complete and acceptable Form CEM-2025 is submitted to the Engineer. Upon completion of all contract work and submittal of the final Form CEM-2025, remaining withheld funds associated with this section, "Solid Waste Disposal and Recycling Report," will be released for payment. Withheld funds in conformance with this section shall be in addition to other moneys withheld provided for in the contract. No interest will be due the Contractor on withheld amounts.

Full compensation for preparing and submitting Form CEM-2025, "Solid Waste Disposal and Recycling Report," shall be considered as included in the contract price for the various items of work involved and no additional compensation will be allowed therefor.

5-1.07 (BLANK)

5-1.08 SUBCONTRACTOR AND DVBE RECORDS

The Contractor shall maintain records of all subcontracts entered into with certified DVBE subcontractors and records of materials purchased from certified DVBE suppliers. The records shall show the name and business address of each DVBE subcontractor or vendor and the total dollar amount actually paid each DVBE subcontractor or vendor.

Upon completion of the contract, a summary of these records shall be prepared on Form CEM-2402 (S) and certified correct by the Contractor or the Contractor's authorized representative, and shall be furnished to the Engineer.

5-1.086 PERFORMANCE OF DVBE SUBCONTRACTORS AND SUPPLIERS

The DVBEs listed by the Contractor in response to the provisions in Section 2-1.04, "Submission of DVBE Information," and Section 3, "Award and Execution of Contract," of these special provisions, which are determined by the Department to be certified DVBEs, shall perform the work and supply the materials for which they are listed, unless the Contractor has received prior written authorization to perform the work with other forces or to obtain the materials from other sources.

Authorization to utilize other forces or sources of materials may be requested for the following reasons:

- A. The listed DVBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, when the written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of the subcontractor's or supplier's written bid, is presented by the Contractor.
- B. The listed DVBE becomes bankrupt or insolvent.
- C. The listed DVBE fails or refuses to perform the subcontract or furnish the listed materials.
- D. The Contractor stipulated that a bond was a condition of executing a subcontract and the listed DVBE subcontractor fails or refuses to meet the bond requirements of the Contractor.
- E. The work performed by the listed subcontractor is substantially unsatisfactory and is not in substantial conformance with the plans and specifications or the subcontractor is substantially delaying or disrupting the progress of the work.
- F. The listed DVBE subcontractor is not licensed pursuant to the Contractor's License Law.
- G. It would be in the best interest of the State.

The Contractor shall not be entitled to payment for the work or material unless it is performed or supplied by the listed DVBE or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

5-1.09 SUBCONTRACTING

Attention is directed to the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, Section 2, "Proposal Requirements and Conditions," Section 2-1.04, "Submission of DVBE Information," and Section 3, "Award and Execution of Contract," of these special provisions and these special provisions.

Pursuant to the provisions in Section 1777.1 of the Labor Code, the Labor Commissioner publishes and distributes a list of contractors ineligible to perform work as a subcontractor on a public works project. This list of debarred contractors is available from the Department of Industrial Relations web site at:

<http://www.dir.ca.gov/DLSE/Debar.html>.

The DVBE information furnished under Section 2-1.04, "Submission of DVBE Information," of these special provisions is in addition to the subcontractor information required to be furnished in Section 8-1.01, "Subcontracting," and Section 2-1.054, "Required Listing of Proposed Subcontractors," of the Standard Specifications.

Section 10115 of the Public Contract Code requires the Department to implement provisions to establish a goal for Disabled Veteran Business Enterprise (DVBE) participation in highway contracts that are State funded. As a part of this requirement:

- A. No substitution of a DVBE subcontractor shall be made at any time without the written consent of the Department, and
- B. If a DVBE subcontractor is unable to perform successfully and is to be replaced, the Contractor shall make good faith efforts to replace the original DVBE subcontractor with another DVBE subcontractor.

The provisions in Section 2-1.02, "Disabled Veteran Business Enterprise (DVBE)," of these special provisions that DVBEs shall be certified on the date bids are opened does not apply to DVBE substitutions after award of the contract.

5-1.10 PROMPT PROGRESS PAYMENT TO SUBCONTRACTORS

Attention is directed to the provisions in Sections 10262 and 10262.5 of the Public Contract Code concerning prompt payment to subcontractors.

5-1.103 RECORDS

The Contractor shall maintain cost accounting records for the contract pertaining to, and in such a manner as to provide a clear distinction between, the following six categories of costs of work during the life of the contract:

- A. Direct costs of contract item work.
- B. Direct costs of changes in character in conformance with Section 4-1.03C, "Changes in Character of Work," of the Standard Specifications.
- C. Direct costs of extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.
- D. Direct costs of work not required by the contract and performed for others.
- E. Direct costs of work performed under a notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications.
- F. Indirect costs of overhead.

Cost accounting records shall include the information specified for daily extra work reports in Section 9-1.03C, "Records," of the Standard Specifications. The requirements for furnishing the Engineer completed daily extra work reports shall only apply to work paid for on a force account basis.

The cost accounting records for the contract shall be maintained separately from other contracts, during the life of the contract, and for a period of not less than 3 years after the date of acceptance of the contract. If the Contractor intends to file claims against the Department, the Contractor shall keep the cost accounting records specified above until complete resolution of all claims has been reached.

5-1.104 INTERNET DAILY EXTRA WORK REPORT

When extra work is being paid for on a force account basis, the Contractor shall submit daily extra work reports in conformance with the provisions in Section 9-1.03C, "Records," of the Standard Specifications and these special provisions.

The Contractor shall send daily extra work reports to the Engineer using the Department's Internet extra work billing system. The reports shall conform to the requirements in the "iCAS User's Guide" (Guide). The Guide is available from the Department, and is also found on the Internet at:

http://www.dot.ca.gov/hq/construc/ewb/EWB_INSTRUCTION.pdf

The Department will provide system accounts to the Contractor's authorized representatives when at least one of the representatives has received training. The Department will provide system training to at least one of the Contractor's authorized representatives within 30 days of the Contractor's request for training. The Department will assign an account and

user identification to the Contractor's authorized representatives, and each Contractor's authorized representative shall maintain a unique password. A daily extra work report that the Contractor's authorized representative sends to the Department using the Internet extra work billing system will be considered signed by the Contractor. A daily extra work report that the Engineer approves using the Internet extra work billing system will be considered signed by the Engineer.

Daily extra work reports that include billing for materials shall be substantiated by a valid copy of a vendor's invoice in conformance to the requirements in Section 9-1.03C, "Records," of the Standard Specifications. Each materials invoice shall clearly identify the relative daily extra work report and the associated cost of the materials. In addition to postal service and parcel service and if approved by the Engineer, invoices may be sent by facsimile or as an electronic-mail attachment.

The Contractor shall maintain the Contractor's interface with the Department's Internet extra work billing system. If the Contractor is using the file transfer process to submit extra work reports, it shall conform to the file transfer format and process defined in the Guide.

5-1.11 PARTNERING

The State will promote the formation of a "Partnering" relationship with the Contractor in order to effectively complete the contract to the benefit of both parties. The purpose of this relationship is to maintain a cooperative communication and to mutually resolve conflicts at the lowest responsible management level.

The Contractor may request the formation of a "Partnering" relationship by submitting a request in writing to the Engineer after approval of the contract. If the Contractor's request for "Partnering" is approved by the Engineer, scheduling of a "Partnering Workshop," selecting the "Partnering" facilitator and workshop site, and other administrative details shall be as agreed to by both parties. If agreed to by the parties, additional "Partnering Workshops" will be conducted as needed throughout the life of the contract.

The costs involved in providing the "Partnering Workshop" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Partnering Workshop" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with "Partnering Workshops" will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

The establishment of a "Partnering" relationship will not change or modify the terms and conditions of the contract and will not relieve either party of the legal requirements of the contract.

5-1.114 VALUE ANALYSIS

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer, scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

<http://www.dot.ca.gov/hq/oppd/value/>

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special

Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

5-1.12 DISPUTE REVIEW BOARD

GENERAL

To assist in the resolution of disputes or potential claims arising out of the work of this project, a Dispute Review Board, hereinafter referred to as the "DRB," shall be established, unless the Contractor, within 45 days of approval of the contract, either submits a written statement to the Engineer indicating the Contractor's unwillingness to participate in a DRB and outlines the reasons therefor or fails to take action for establishment of the DRB as provided herein. If a DRB is not established within 45 days of approval of the contract, a DRB will not be established for this project. The DRB is intended to assist the contract administrative claims resolution process as specified in the provisions in Section 9-1.04, "Notice of Potential Claim," and Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications and these special provisions. The DRB shall not serve as a substitute for provisions in the specifications in regard to filing potential claims. If the DRB is established, the requirements and procedures established in this section shall be a prerequisite to filing a claim, filing for arbitration, or filing for litigation prior or subsequent to project completion.

The DRB shall be utilized when dispute or potential claim resolution at the project level is unsuccessful. The DRB shall function as specified herein until the day of acceptance of the contract, at which time the work of the DRB will cease except for completion of unfinished reports. No DRB dispute meetings shall take place later than 30 days prior to acceptance of contract. After acceptance of contract, disputes or potential claims which have followed the dispute resolution processes of the Standard Specifications and these special provisions, but have not been resolved, shall be stated or restated by the Contractor, in response to the Proposed Final Estimate within the time limits provided in Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. The State will review those claims in conformance with the provisions in Section 9-1.07B of the Standard Specifications. Following the adherence to and completion of the contractual administrative claims procedure, the Contractor may file for arbitration in conformance with the provisions in Section 9-1.10, "Arbitration," of the Standard Specifications and these special provisions.

Disputes, as used in this section, shall include differences of opinion, properly noticed as provided hereinafter, between the State and Contractor on matters related to the work and other subjects considered by the State or Contractor, or by both, to be of concern to the DRB on this project, except matters relating to Contractor, subcontractor or supplier potential claims not actionable against the Department as specified in these special provisions or quantification of disputes for overhead type expenses or costs. Disputes for overhead type expenses or costs shall conform to the requirements of Section 9-1.07B, "Final Payment and Claims," of the Standard Specifications. Whenever the term "dispute" or "disputes" is used herein, it shall be deemed to include potential claims as well as disputes.

The DRB shall serve as an advisory body to assist in the resolution of disputes between the State and the Contractor, hereinafter referred to as the "parties." The DRB shall consider disputes referred to it, and furnish written reports containing findings and recommendations pertaining to those disputes, to the parties to aid in resolution of the differences between them. DRB findings and recommendations are not binding on the parties.

SELECTION PROCESS, DISCLOSURE AND APPOINTMENTS

The DRB shall consist of one member selected by the State and approved by the Contractor, one member selected by the Contractor and approved by the State, and a third member selected by the first 2 members and approved by both the State and the Contractor. The third member shall act as the DRB Chairperson.

DRB members shall be especially knowledgeable in the type of construction and contract documents potentially anticipated by the contract. DRB members shall discharge their responsibilities impartially as an independent body, considering the facts and circumstances related to the matters under consideration, pertinent provisions of the contract and applicable laws and regulations.

The State and the Contractor shall nominate and approve DRB members in conformance with the terms and conditions of the Dispute Review Board Agreement and these special provisions, within 45 days of the approval of the contract. Each party shall provide written notification to the other of the name of their selected DRB nominee along with the prospective member's complete written disclosure statement.

Disclosure statements shall include a resume of the prospective member's experience and a declaration statement describing past, present, anticipated, and planned relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the parties involved in this construction contract, including but not limited to, relevant subcontractors or suppliers to the parties, parties' principals, or parties' counsel. DRB members shall also include a full disclosure of close professional or personal relationships with all key members of the contract. Objections to nominees must be based on a specific breach or violation of nominee responsibilities or on nominee qualifications under these provisions unless otherwise specified. The Contractor or the State may, on a one-time basis, object

to the other's nominee without specifying a reason and this person will not be selected for the DRB. Another person shall then be nominated within 15 days.

The first duty of the State and Contractor selected members of the DRB shall be to select and recommend a prospective third DRB member to the parties for final selection and approval. The first 2 DRB members shall proceed with the selection of the third DRB member immediately upon receiving written notification from the State of their selection, and shall provide their recommendation simultaneously to the parties within 15 days of the notification.

The first 2 DRB members shall select a third DRB member subject to mutual approval of the parties or may mutually concur on a list of potentially acceptable third DRB members and submit the list to the parties for final selection and approval of the third member. The goal in the selection of the third member is to complement the professional experience of the first 2 members and to provide leadership for the DRB's activities.

The third prospective DRB member shall supply a full disclosure statement to the first 2 DRB members and to the parties prior to appointment.

An impasse shall be considered to have been reached if the parties are unable to approve a third member within 15 days of receipt of the recommendation of the first 2 DRB members, or if the first 2 DRB members are unable to agree upon a recommendation within their 15 day time limit. In the event of an impasse in selection of third DRB member the State and the Contractor shall each propose 3 candidates for the third DRB member position. The parties shall select the candidates proposed under this paragraph from the current list of arbitrators certified by the Public Works Contract Arbitration Committee created by Article 7.2 (commencing with Section 10245) of the State Contract Act. The first 2 DRB members shall then select one of the 6 proposed candidates in a blind draw.

No DRB member shall have prior direct involvement in this contract. No member shall have a financial interest in this contract or the parties thereto, within a period of 6 months prior to award of this contract or during the contract, except as follows:

- A. Compensation for services on this DRB.
- B. Ownership interest in a party or parties, documented by the prospective DRB member, that has been reviewed and determined in writing by the State to be sufficiently insignificant to render the prospective member acceptable to the State.
- C. Service as a member of other Dispute Review Boards on other contracts.
- D. Retirement payments or pensions received from a party that are not tied to, dependent on or affected by the net worth of the party.
- E. The above provisions apply to parties having a financial interest in this contract, including but not limited to contractors, subcontractors, suppliers, consultants, and legal and business services.

The Contractor or the State may reject any of the three DRB members who fail to fully comply at all times with all required employment and financial disclosure conditions of DRB membership as described in the Dispute Review Board Agreement and as specified herein. A copy of the Dispute Review Board Agreement is included in this section.

The Contractor, the State, and the 3 members of the DRB shall complete and adhere to the Dispute Review Board Agreement in administration of this DRB within 15 days of the parties' concurrence in the selection of the third member. No DRB meeting shall take place until the Dispute Review Board Agreement has been signed by all parties. The State authorizes the Engineer to execute and administer the terms of the Agreement. The person(s) designated by the Contractor as authorized to execute contract change orders shall be authorized to execute and administer the terms of this agreement, or to delegate the authority in writing. The operation of the DRB shall be in conformance with the terms of the Dispute Review Board Agreement.

COMPENSATION

The State and the Contractor shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time, (such as time spent evaluating and preparing recommendations on specific issues presented to the DRB), has been specifically agreed to in advance by the State and Contractor. Time away from the project, which has been specifically agreed to in advance by the parties, will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the Department, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The State will provide, at no cost to the Contractor,

administrative services such as conference facilities and secretarial services to the DRB. These special provisions and the Dispute Review Board Agreement state the provisions for compensation and expenses of the DRB. DRB members shall be compensated at the same daily and hourly rate. The Contractor shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The State will reimburse the Contractor for the State's share of the costs. There will be no markups applied to expenses connected with the DRB, either by the DRB members or by the Contractor when requesting payment of the State's share of DRB expenses. Regardless of the DRB recommendation, neither party shall be entitled to reimbursement of DRB costs from the other party.

REPLACEMENT OF DRB MEMBERS

Service of a DRB member may be terminated at any time with not less than 15 days notice as follows:

- A. The State may terminate service of the State appointed member.
- B. The Contractor may terminate service of the Contractor appointed member.
- C. Upon the written recommendation of the State and Contractor appointed members for the removal of the third member.
- D. Upon resignation of a member.
- E. The State or Contractor may terminate the service of any member who fails to fully comply with all required employment and financial disclosure conditions of DRB membership

When a member of the DRB is replaced, the replacement member shall be appointed in the same manner as the replaced member was appointed. The appointment of a replacement DRB member will begin promptly upon determination of the need for replacement and shall be completed within 15 days. Changes in either of the DRB members chosen by the two parties will not require re-selection of the third member, unless both parties agree to such re-selection in writing. The Dispute Review Board Agreement shall be amended to reflect the change of a DRB member.

OPERATION

The following procedure shall be used for dispute resolution:

- A. If the Contractor objects to any decision, act or order of the Engineer, the Contractor shall give written notice of potential claim in conformance with the provisions in Section 9-1.04, "Notice of Potential Claim," of the Standard Specifications and these special provisions, including the provision of applicable cost documentation; or file written protests or notices in conformance with the provisions in the Standard Specifications and these special provisions.
- B. The Engineer will respond, in writing, to the Contractor's written supplemental notice of potential claim within 20 days of receipt of the notice.
- C. Within 15 days after receipt of the Engineer's written response, the Contractor shall, if the Contractor still objects, file a written reply with the Engineer, stating clearly and in detail the basis of the objection.
- D. Following an objection to the Engineer's written response, the Contractor shall refer the dispute to the DRB if the Contractor wishes to further pursue the objection to the Engineer's decision. The Contractor shall make the referral in writing to the DRB, simultaneously copied to the State, within 21 days after receipt of the written response from the Engineer. The written dispute referral shall describe the disputed matter in individual discrete segments so that it will be clear to both parties and the DRB what discrete elements of the dispute have been resolved, and which remain unresolved, and shall include an estimate of the cost of the affected work and impacts, if any, on project completion.
- E. By failing to submit the written notice of referral to the DRB, within 21 days after receipt of the Engineer's written response to the supplemental notice of potential claim, the Contractor waives future claims and arbitration on the matter in contention.
- F. The Contractor and the State shall each be afforded an opportunity to be present and to be heard by the DRB, and to offer evidence. Either party furnishing written evidence or documentation to the DRB must furnish copies of such information to the other party a minimum of 15 days prior to the date the DRB is scheduled to convene the meeting for the dispute. Either party shall produce such additional evidence as the DRB may deem necessary to reach an understanding and a determination of the dispute. The party furnishing additional evidence shall furnish copies of such additional evidence to the other party at the same time the evidence is provided to the DRB. The DRB shall not consider evidence not furnished in conformance with the terms specified herein.
- G. Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral unless otherwise agreed to by all parties. The DRB shall determine the time and location of the DRB

dispute meeting, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of a timely hearing of the dispute.

- H. There shall be no participation of either party's attorneys at DRB dispute meetings.
- I. There shall be no participation of persons who are not directly involved in the contract or who do not have direct knowledge of the dispute, including but not limited to consultants, except for expert testimony allowed at the discretion of the DRB and with approval prior to the dispute meeting by both parties.
- J. The DRB shall furnish a report, containing findings and recommendations as described in the Dispute Review Board Agreement, in writing to both the State and the Contractor. The DRB may request clarifying information of either party within 10 days after the DRB dispute meeting. Requested information shall be submitted to the DRB within 10 days of the DRB request. The DRB shall complete its report, including minority opinion, if any, and submit it to the parties within 30 days of the DRB dispute meeting, except that time extensions may be granted at the request of the DRB with the written concurrence of both parties. The report shall include the facts and circumstances related to the matters under consideration, pertinent provisions of the contract, applicable laws and regulations, and actual costs and time incurred as shown on the Contractor's cost accounting records. The DRB shall make recommendations on the merit of the dispute and, if appropriate, recommend guidelines for determining compensation.
- K. Within 30 days after receiving the DRB's report, both the State and the Contractor shall respond to the DRB in writing signifying that the dispute is either resolved or remains unresolved. Failure to provide the written response within the time specified, or a written rejection of the DRB's recommendation or response to a request for reconsideration presented in the report by either party, shall conclusively indicate that the party(s) failing to respond accepts the DRB recommendation. Immediately after responses have been received from both parties, the DRB shall provide copies of both responses to the parties simultaneously. Either party may request clarification of elements of the DRB's report from the DRB prior to responding to the report. The DRB shall consider any clarification request only if submitted within 10 days of receipt of the DRB's report, and if submitted simultaneously in writing to both the DRB and the other party. Each party may submit only one request for clarification for any individual DRB report. The DRB shall respond, in writing, to requests for clarification within 10 days of receipt of such requests.
- L. The DRB's recommendations, stated in the DRB's reports, are not binding on either party. Either party may seek a reconsideration of a recommendation of the DRB. The DRB shall only grant a reconsideration based upon submission of new evidence and if the request is submitted within the 30-day time limit specified for response to the DRB's written report. Each party may submit only one request for reconsideration regarding an individual DRB recommendation.
- M. If the State and the Contractor are able to resolve their dispute with the aid of the DRB's report, the State and Contractor shall promptly accept and implement the recommendations of the DRB. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.
- N. The State or the Contractor shall not call DRB members who served on the DRB for this contract as witnesses in arbitration proceedings which may arise from this contract, and all documents created by the DRB shall be inadmissible as evidence in subsequent arbitration proceedings, except the DRB's final written reports on each issue brought before it.
- O. The State and Contractor shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.
- P. The DRB members shall have no claim against the State or the Contractor, or both, from claimed harm arising out of the parties' evaluations of the DRB's report.

DISPUTES INVOLVING SUBCONTRACTOR POTENTIAL CLAIMS

For purposes of this section, a "subcontractor potential claim" shall include any potential claim by a subcontractor (including also any pass through potential claims by a lower tier subcontractor or supplier) against the Contractor that is actionable by the Contractor against the Department which arises from the work, services, or materials provided or to be provided in connection with the contract. If the Contractor determines to pursue a dispute against the Department that includes a subcontractor potential claim, the dispute shall be processed and resolved in conformance with these special provisions and in conformance with the following:

- A. The Contractor shall identify clearly in submissions pursuant to this section, that portion of the dispute that involves a subcontractor potential claim or potential claims.
- B. The Contractor shall include, as part of its submission pursuant to Step D above, a certification (False Claims Act Certification) by the subcontractor's or supplier's officer, partner, or authorized representative with authority to bind

the subcontractor and with direct knowledge of the facts underlying the subcontractor potential claim. The Contractor shall submit a certification that the subcontractor potential claim is acknowledged and forwarded by the Contractor. The form for these certifications is available from the Engineer.

- C. At DRB dispute meetings involving one or more subcontractor potential claims, the Contractor shall require that each subcontractor involved in the dispute have present an authorized representative with actual knowledge of the facts underlying the subcontractor potential claim to assist in presenting the subcontractor potential claim and to answer questions raised by the DRB members or the Department's representatives.
- D. Failure by the Contractor to declare a subcontractor potential claim on behalf of its subcontractor (including lower tier subcontractors' and suppliers' pass through potential claims) at the time of submission of the Contractor's potential claims, as provided hereunder, shall constitute a release of the State by the Contractor of such subcontractor potential claim.
- E. The Contractor shall include in all subcontracts under this contract that subcontractors and suppliers of any tier (a) agree to submit subcontractor potential claims to the Contractor in a proper form and in sufficient time to allow processing by the Contractor in conformance with the Dispute Review Board resolution specifications; (b) agree to be bound by the terms of the Dispute Review Board provisions to the extent applicable to subcontractor potential claims; (c) agree that, to the extent a subcontractor potential claim is involved, completion of all steps required under these Dispute Review Board special provisions shall be a condition precedent to pursuit by the subcontractor of other remedies permitted by law, including without limitation of a lawsuit against the Contractor; and (d) agree that the existence of a dispute resolution process for disputes involving subcontractor potential claims shall not be deemed to create any claim, right, or cause of action by any subcontractor or supplier against the Department.

Notwithstanding the foregoing, this Dispute Review Board special provision shall not apply to, and the DRB shall not have the authority to consider, subcontractor potential claims between the subcontractor(s) or supplier(s) and the Contractor that are not actionable by the Contractor against the Department.

DISPUTE REVIEW BOARD AGREEMENT

A copy of the "Dispute Review Board Agreement" to be executed by the Contractor, State and the 3 DRB members after approval of the contract follows:

DISPUTE REVIEW BOARD AGREEMENT

(Contract Identification)

Contract No. _____

THIS DISPUTE REVIEW BOARD AGREEMENT, hereinafter called "AGREEMENT", made and entered into this _____ day of _____, _____, between the State of California, acting through the California Department of Transportation and the Director of Transportation, hereinafter called the "STATE," _____ hereinafter called the "CONTRACTOR," and the Dispute Review Board, hereinafter called the "DRB" consisting of the following members:

_____,
(Contractor Appointee)

_____,
(State Appointee)

and _____
(Third Person)

WITNESSETH, that

WHEREAS, the STATE and the CONTRACTOR, hereinafter called the "parties," are now engaged in the construction on the State Highway project referenced above; and

WHEREAS, the special provisions for the above referenced contract provides for the establishment and operation of the DRB to assist in resolving disputes; and

WHEREAS, the DRB is composed of three members, one selected by the STATE, one selected by the CONTRACTOR, and the third member selected by the other two members and approved by the parties;

NOW THEREFORE, in consideration of the terms, conditions, covenants, and performance contained herein, or attached and incorporated and made a part hereof, the STATE, the CONTRACTOR, and the DRB members hereto agree as follows:

SECTION I DESCRIPTION OF WORK

To assist in the resolution of disputes between the parties, the contract provides for the establishment and the operation of the DRB. The intent of the DRB is to fairly and impartially consider disputes placed before it and provide written recommendations for resolution of these disputes to both parties. The members of this DRB shall perform the services necessary to participate in the DRB's actions as designated in Section II, Scope of Work.

SECTION II SCOPE OF WORK

The scope of work of the DRB includes, but is not limited to, the following:

A. OBJECTIVE

The principal objective of the DRB is to assist in the timely resolution of disputes between the parties arising from performance of this contract. It is not intended for either party to default on their normal responsibility to amicably and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the mere existence of the DRB will encourage the parties to resolve disputes without resorting to this review procedure. But when a dispute that is serious enough to warrant the DRB's review does develop, the process for prompt and efficient action will be in place.

B. PROCEDURES

The DRB shall render written reports on disputes between the parties arising from the construction contract. Prior to consideration of a dispute, the DRB shall establish rules and regulations that will govern the conduct of its business and reporting procedures in conformance with the requirements of the contract and the terms of this AGREEMENT. DRB

recommendations, resulting from its consideration of a dispute, shall be furnished in writing to both parties. The recommendations shall be based on facts and circumstances involved in the dispute, pertinent contract provisions, applicable laws and regulations. The recommendations shall find one responsible party in a dispute; shared or "jury" determinations shall not be rendered. The DRB shall make recommendations on the merit of the dispute, and if appropriate, recommend guidelines for determining compensation. If the parties cannot agree on compensation within 60 days of the acceptance by both parties of the DRB's recommendation, either party may request the DRB to make a recommendation regarding compensation.

The DRB shall refrain from officially giving advice or consulting services to anyone involved in the contract. The individual members shall act in a completely independent manner and while serving as members of the DRB shall have no consulting business connections with either party or its principals or attorneys or other affiliates (subcontractors, suppliers, etc.) who have a beneficial interest in the contract.

During scheduled meetings of the DRB as well as during dispute meetings, DRB members shall refrain from expressing opinions on the merits of statements on matters under dispute or potential dispute. Opinions of DRB members expressed in private sessions shall be kept strictly confidential. Individual DRB members shall not meet with, or discuss contract issues with individual parties, except as directed by the DRB Chairperson. Such discussions or meetings shall be disclosed to both parties. Other discussions regarding the project between the DRB members and the parties shall be in the presence of all three members and both parties. Individual DRB members shall not undertake independent investigations of any kind pertaining to disputes or potential disputes, except with the knowledge of both parties and as expressly directed by the DRB Chairperson.

C. CONSTRUCTION SITE VISITS, PROGRESS MEETINGS AND FIELD INSPECTIONS

The DRB members shall visit the project site and meet with representatives of the parties to keep abreast of construction activities and to develop familiarity with the work in progress. Scheduled progress meetings shall be held at or near the project site. The DRB shall meet at least once at the start of the project, and at least once every 4 months thereafter. The frequency, exact time, and duration of additional site visits and progress meetings shall be as recommended by the DRB and approved by the parties consistent with the construction activities or matters under consideration and dispute. Each meeting shall consist of a round table discussion and a field inspection of the work being performed on the contract, if necessary. Each meeting shall be attended by representatives of both parties. The agenda shall generally be as follows:

1. Meeting opened by the DRB Chairperson.
2. Remarks by the STATE's representative.
3. A description by the CONTRACTOR's representative of work accomplished since the last meeting; the current schedule status of the work; and a forecast for the coming period.
4. An outline by the CONTRACTOR's representative of potential problems and a description of proposed solutions.
5. An outline by the STATE's representative of the status of the work as the STATE views it.
6. A brief description by the CONTRACTOR's or STATE's representative of potential claims or disputes which have surfaced since the last meeting.
7. A summary by the STATE's representative, the CONTRACTOR's representative, or the DRB of the status of past disputes and potential claims.

The STATE's representative will prepare minutes of all progress meetings and circulate them for revision and approval by all concerned within 10 days of the meeting.

The field inspection shall cover all active segments of the work, the DRB being accompanied by both parties' representatives. The field inspection may be waived upon mutual agreement of the parties.

D. DRB CONSIDERATION AND HANDLING OF DISPUTES

Upon receipt by the DRB of a written referral of a dispute, the DRB shall convene to review and consider the dispute. The dispute meeting shall be held no earlier than 30 days and no later than 60 days after receipt of the written referral, unless otherwise agreed to by all parties. The DRB shall determine the time and location of DRB dispute meetings, with due consideration for the needs and preferences of the parties while recognizing the paramount importance of speedy resolution of issues. No dispute meetings shall take place later than 30 days prior to acceptance of contract.

Normally, dispute meetings shall be conducted at or near the project site. However, any location that would be more convenient and still provide required facilities and access to necessary documentation shall be satisfactory.

Both parties shall be given the opportunity to present their evidence at these dispute meetings. It is expressly understood that the DRB members are to act impartially and independently in the consideration of the contract provisions, applicable laws and regulations, and the facts and conditions surrounding any dispute presented by either party, and that the recommendations concerning any such dispute are advisory and nonbinding on the parties.

The DRB may request that written documentation and arguments from both parties be sent to each DRB member, through the DRB Chairperson, for review before the dispute meeting begins. A party furnishing written documentation to the

DRB shall furnish copies of such information to the other party at the same time that such information is supplied to the DRB.

DRB dispute meetings shall be informal. There shall be no testimony under oath or cross-examination. There shall be no reporting of the procedures by a shorthand reporter or by electronic means. Documents and verbal statements shall be received by the DRB in conformance with acceptance standards established by the DRB. These standards need not comply with prescribed legal laws of evidence.

The third DRB member shall act as Chairperson for dispute meetings and all other DRB activities. The parties shall have a representative at all dispute meetings. Failure to attend a duly noticed dispute meeting by either of the parties shall be conclusively considered by the DRB as indication that the non-attending party considers written submittals as their entire and complete argument. The claimant shall discuss the dispute, followed by the other party. Each party shall then be allowed one or more rebuttals until all aspects of the dispute are thoroughly covered. DRB members shall ask questions, seek clarification, and request further data from either of the parties as may be necessary to assist in making a fully informed recommendation. The DRB may request from either party documents or information that would assist the DRB in making its findings and recommendations including, but not limited to, documents used by the CONTRACTOR in preparing the bid for the project. A refusal by a party to provide information requested by the DRB may be considered by the DRB as an indication that the requested material would tend to disprove that party's position. In large or complex cases, additional dispute meetings may be necessary in order to consider all the evidence presented by both parties. All involved parties shall maintain the confidentiality of all documents and information, as provided in this AGREEMENT.

During dispute meetings, no DRB member shall express an opinion concerning the merit of any facet of the case. DRB deliberations shall be conducted in private, with interim individual views kept strictly confidential.

After dispute meetings are concluded, the DRB shall meet in private and reach a conclusion supported by 2 or more members. Private sessions of the DRB may be held at a location other than the job site or by electronic conferencing as deemed appropriate, in order to expedite the process.

The DRB's findings and recommendations, along with discussion of reasons therefor, shall then be submitted as a written report to both parties. Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and facts and circumstances related to the dispute. The report shall be thorough in discussing the facts considered, the contract language, law or regulation viewed by the DRB as pertinent to the issues, and the DRB's interpretation and philosophy in arriving at its conclusions and recommendations. The DRB's report shall stand on its own, without attachments or appendices. The DRB Chairperson shall furnish a copy of the written recommendation report to the DRB Coordinator, Division of Construction, MS 44, P.O. Box 942874, Sacramento, CA 94274.

With prior written approval of both parties, the DRB may obtain technical services necessary to adequately review the disputes presented, including audit, geotechnical, schedule analysis and other services. The parties' technical staff may supply those services as appropriate. The cost of technical services, as agreed to by the parties, shall be borne equally by the 2 parties as specified in an approved contract change order. The CONTRACTOR will not be entitled to markups for the payments made for these services.

The DRB shall resist submittal of incremental portions of information by either party, in the interest of making a fully informed decision and recommendation.

The DRB shall make every effort to reach a unanimous decision. If this proves impossible, the dissenting member shall prepare a minority opinion, which shall be included in the DRB's report.

Although both parties should place weight upon the DRB's recommendations, they are not binding. Either party may appeal a recommendation to the DRB for reconsideration. However, reconsideration shall only be allowed when there is new evidence to present, and the DRB shall accept only one appeal from each party pertaining to an individual DRB recommendation. The DRB shall hear appeals in conformance with the terms described in the Section entitled "Dispute Review Board" in the special provisions.

E. DRB MEMBER REPLACEMENT

Should the need arise to appoint a replacement DRB member, the replacement DRB member shall be appointed in the same manner as the original DRB members were appointed. The selection of a replacement DRB member shall begin promptly upon notification of the necessity for a replacement and shall be completed within 15 days. This AGREEMENT shall be amended to indicate change in DRB membership.

SECTION III CONTRACTOR RESPONSIBILITIES

The CONTRACTOR shall furnish to each DRB member one copy of pertinent documents that are or may become necessary for the DRB to perform their function. Pertinent documents are written notices of potential claim, responses to those notices, drawings or sketches, calculations, procedures, schedules, estimates, or other documents which are used in the performance of the work or in justifying or substantiating the CONTRACTOR's position. The CONTRACTOR shall also furnish a copy of such pertinent documents to the STATE, in conformance with the terms outlined in the special provisions.

SECTION IV STATE RESPONSIBILITIES

The STATE will furnish the following services and items:

A. CONTRACT RELATED DOCUMENTS

The STATE will furnish to each DRB member one copy of Notice to Contractors and Special Provisions, Proposal and Contract, Plans, Standard Specifications, and Standard Plans, change orders, written instructions issued by the STATE to the CONTRACTOR, or other documents pertinent to any dispute that has been referred to the DRB and necessary for the DRB to perform its function.

B. COORDINATION AND SERVICES

The STATE, through the Engineer, will, in cooperation with the CONTRACTOR, coordinate the operations of the DRB. The Engineer will arrange or provide conference facilities at or near the project site and provide secretarial and copying services to the DRB without charge to the CONTRACTOR.

SECTION V TIME FOR BEGINNING AND COMPLETION

Once established, the DRB shall be in operation until the day of acceptance of the contract. The DRB members shall not begin work under the terms of this AGREEMENT until authorized in writing by the STATE.

SECTION VI PAYMENT

A. ALL INCLUSIVE RATE PAYMENT

The STATE and the CONTRACTOR shall bear the costs and expenses of the DRB equally. Each DRB member shall be compensated at an agreed rate of \$1,200 per day if time spent per meeting, including on-site time plus one hour of travel time, is greater than 4 hours. Each DRB member shall be compensated at an agreed rate of \$700 per day if time spent per meeting, including on-site time plus one hour of travel time, is less than or equal to 4 hours. The agreed rates shall be considered full compensation for on-site time, travel expenses, transportation, lodging, time for travel and incidentals for each day, or portion thereof, that the DRB member is at an authorized DRB meeting. No additional compensation will be made for time spent by DRB members in review and research activities outside the official DRB meetings unless that time has been specifically agreed to in advance by the STATE and CONTRACTOR. Time away from the project that has been specifically agreed to in advance by the parties will be compensated at an agreed rate of \$125 per hour. The agreed amount of \$125 per hour shall include all incidentals including expenses for telephone, fax, and computer services. Members serving on more than one DRB involving the State, regardless of the number of meetings per day, shall not be paid more than the all inclusive rate per day or rate per hour for an individual project. The STATE will provide, at no cost to the CONTRACTOR, administrative services such as conference facilities and secretarial services to the DRB.

B. PAYMENTS

DRB members shall be compensated at the same rate. The CONTRACTOR shall make direct payments to each DRB member for their participation in authorized meetings and approved hourly rate charges from invoices submitted by each DRB member. The STATE will reimburse the CONTRACTOR for its share of the costs of the DRB.

The DRB members may submit invoices to the CONTRACTOR for partial payment for work performed and services rendered for their participation in authorized meetings not more often than once per month during the progress of the work. The invoices shall be in a format approved by the parties and accompanied by a general description of activities performed during that billing period. Payment for hourly fees, at the agreed rate, shall not be paid to a DRB member until the amount and extent of those fees are approved by the STATE and CONTRACTOR.

Invoices shall be accompanied by original supporting documents, which the CONTRACTOR shall include with the extra work billing when submitting for reimbursement of the STATE's share of cost from the STATE. The CONTRACTOR will be reimbursed for one-half of approved costs of the DRB. No markups will be added to the CONTRACTOR's payment.

C. INSPECTION OF COSTS RECORDS

The DRB members and the CONTRACTOR shall keep available for inspection by representatives of the STATE and the United States, for a period of 3 years after final payment, the cost records and accounts pertaining to this AGREEMENT. If any litigation, claim, or audit arising out of, in connection with, or related to this contract is initiated before the expiration of the 3-year period, the cost records and accounts shall be retained until such litigation, claim, or audit involving the records is completed.

SECTION VII ASSIGNMENT OF TASKS OF WORK

The DRB members shall not assign the work of this AGREEMENT.

SECTION VIII TERMINATION OF DRB MEMBERS

DRB members may resign from the DRB by providing not less than 15 days written notice of the resignation to the STATE and CONTRACTOR. DRB members may be terminated by their original appointing power or by either party, for failing to fully comply at all times with all required employment and financial disclosure conditions of DRB membership in conformance with the terms of the contract.

SECTION IX LEGAL RELATIONS

The parties hereto mutually understand and agree that the DRB member in the performance of duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either party.

No party to this AGREEMENT shall bear a greater responsibility for damages or personal injury than is normally provided by Federal or State of California Law.

Notwithstanding the provisions of this contract that require the CONTRACTOR to indemnify and hold harmless the STATE, the parties shall jointly indemnify and hold harmless the DRB members from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of and resulting from the findings and recommendations of the DRB.

SECTION X CONFIDENTIALITY

The parties hereto mutually understand and agree that all documents and records provided by the parties in reference to issues brought before the DRB, which documents and records are marked "Confidential - for use by the DRB only," shall be kept in confidence and used only for the purpose of resolution of subject disputes, and for assisting in development of DRB findings and recommendations; that such documents and records will not be utilized or revealed to others, except to officials of the parties who are authorized to act on the subject disputes, for any purposes, during the life of the DRB. Upon termination of this AGREEMENT, said confidential documents and records, and all copies thereof, shall be returned to the parties who furnished them to the DRB. However, the parties understand that such documents shall be subsequently discoverable and admissible in court or arbitration proceedings unless a protective order has been obtained by the party seeking further confidentiality.

SECTION XI DISPUTES

Disputes between the parties hereto, including disputes between the DRB members and either party or both parties, arising out of the work or other terms of this AGREEMENT, which cannot be resolved by negotiation and mutual concurrence between the parties, or through the administrative process provided in the contract, shall be resolved by arbitration as provided in Section 9-1.10, "Arbitration," of the Standard Specifications.

SECTION XII VENUE, APPLICABLE LAW, AND PERSONAL JURISDICTION

In the event that any party, including an individual member of the DRB, deems it necessary to institute arbitration proceedings to enforce any right or obligation under this AGREEMENT, the parties hereto agree that such action shall be initiated in the Office of Administrative Hearings of the State of California. The parties hereto agree that all questions shall be resolved by arbitration by application of California law and that the parties to such arbitration shall have the right of appeal from such decisions to the Superior Court in conformance with the laws of the State of California. Venue for the arbitration shall be Sacramento or any other location as agreed to by the parties.

SECTION XIII FEDERAL REVIEW AND REQUIREMENTS

On Federal-Aid contracts, the Federal Highway Administration shall have the right to review the work of the DRB in progress, except for private meetings or deliberations of the DRB.

Other Federal requirements in this agreement shall only apply to Federal-Aid contracts.

SECTION XIV CERTIFICATION OF THE CONTRACTOR, THE DRB MEMBERS, AND THE STATE

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT as of the day and year first above written.

DRB MEMBER

DRB MEMBER

By: _____

By: _____

Title: _____

Title : _____

DRB MEMBER

By : _____

Title : _____

CONTRACTOR

CALIFORNIA STATE DEPARTMENT
OF TRANSPORTATION

By: _____

By: _____

Title: _____

Title: _____

5-1.13 FORCE ACCOUNT PAYMENT

Payment for extra work at force account will be determined by either non-subcontracted or subcontracted force account payment unless otherwise specified.

Non-Subcontracted Force Account Payment:

When extra work to be paid for on a force account basis is performed by the Contractor, compensation will be determined in accordance with Section 9-1.03, "Force Account Payment," of the Standard Specifications and these special provisions.

The second, third and fourth paragraphs of Section 9-1.03A, "Work Performed by Contractor," in the Standard Specifications, shall not apply.

Attention is directed to "Time-Related Overhead" of these special provisions.

To the total of the direct costs for work performed on a force account basis, computed as provided in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications, there will be added the following markups:

Cost	Percent Markup
Labor	28
Materials	10
Equipment Rental	10

The above markups shall be applied to work performed on a force account basis, regardless of whether the work revises the current contract completion date.

The above markups, together with payments made for time-related overhead pursuant to "Time-Related Overhead" of these special provisions, shall constitute full compensation for all overhead costs for work performed on a force account basis. These overhead costs shall be deemed to include all items of expense not specifically designated as cost or equipment rental in conformance with the provisions in Sections 9-1.03A(1), "Labor," 9-1.03A(2), "Materials," and 9-1.03A(3), "Equipment Rental," of the Standard Specifications. The total payment made as provided above and in the first paragraph of Section 9-1.03A, "Work Performed by Contractor," of the Standard Specifications shall be deemed to be the actual cost of the work performed on a force account basis, and shall constitute full compensation therefor.

Full compensation for overhead costs for work performed on a force account basis, and for which no adjustment is made to the quantity for time-related overhead conforming to the provisions in "Time-Related Overhead" of these special provisions, shall be considered as included in the markups specified above, and no additional compensation will be allowed therefor.

Subcontracted Force Account Payment:

When extra work to be paid for on a force account basis is performed by a subcontractor approved in conformance with the provisions in Section 8-1.01, "Subcontracting," of the Standard Specifications, compensation will be determined in accordance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

5-1.14 VALUE ANALYSIS

The Contractor may submit to the Engineer, in writing, a request for a "Value Analysis" workshop. The purpose for having a workshop is to identify value enhancing opportunities and to consider modifications to the plans and specifications that will reduce either the total cost, time of construction or traffic congestion, without impairing, in any manner, the essential functions or characteristics of the project including, but not limited to, service life, economy of operation, ease of maintenance, benefits to the travelling public, desired appearance, or design and safety standards.

To maximize the potential benefits of a workshop, the request should be submitted to the Engineer early in the project after approval of the contract. If the Contractor's request for a "Value Analysis" workshop is approved by the Engineer, scheduling of a workshop, selecting the facilitator and workshop site, and other administrative details shall be determined cooperatively by the Contractor and the Engineer.

The workshop shall be conducted in conformance with the methodology described in the Department's "Value Analysis Team Guide" available at the Department's web site at:

<http://www.dot.ca.gov/hq/oppd/value/>

The facilitator shall be a Certified Value Specialist (CVS) as recognized by the Society of American Value Engineers (SAVE) International, which may be contacted as follows:

SAVE International, 60 Revere Drive, Northbrook, IL 60062
Telephone 1-847-480-1730, FAX 1-847-480-9282

The Contractor may submit recommendations resulting from a "Value Analysis" workshop for approval by the Engineer as cost reduction incentive proposals in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications.

The costs involved in providing the "Value Analysis" facilitator and workshop site will be borne equally by the State and the Contractor. The division of cost will be made by determining the cost in providing the "Value Analysis" facilitator and workshop site in conformance with the provisions in Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost, except no markups will be allowed.

All other costs associated with the "Value Analysis" workshop will be borne separately by the party incurring the costs, such as wages and travel expenses, and no additional compensation will be allowed therefor.

5-1.15 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

The provisions of this section shall apply only to the following contract item:

ITEM CODE	ITEM
390102	ASPHALT CONCRETE (TYPE A)

The compensation payable for asphalt concrete will be increased or decreased in conformance with the provisions of this section for paving asphalt price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The adjustment in compensation will be determined in conformance with the following formulae when the item of asphalt concrete is included in a monthly estimate:

- A. Total monthly adjustment = AQ
- B. For an increase in paving asphalt price index exceeding 10 percent:

$$A = 0.90 (1.1023) (Iu/Ib - 1.10) Ib$$

- C. For a decrease in paving asphalt price index exceeding 10 percent:

$$A = 0.90 (1.1023) (I_u/I_b - 0.90) I_b$$

- D. Where:

A = Adjustment in dollars per tonne of paving asphalt used to produce asphalt concrete rounded to the nearest \$0.01.
I_u = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.

I_b = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.

Q = Quantity in tonnes of paving asphalt that was used in producing the quantity of asphalt concrete shown under "This Estimate" on the monthly estimate using the amount of asphalt determined by the Engineer.

The adjustment in compensation will also be subject to the following:

- A. The compensation adjustments provided herein will be shown separately on payment estimates. The Contractor shall be liable to the State for decreased compensation adjustments and the Department may deduct the amount thereof from moneys due or that may become due the Contractor.
- B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.
- C. In the event of an overrun of contract time, adjustment in compensation for paving asphalt included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is determined each month on the first business day of the month by the Department using the median of posted prices in effect as posted by Chevron, Mobil, and Unocal for the Buena Vista, Huntington Beach, Kern River, Long Beach, Midway Sunset, and Wilmington fields.

In the event that the companies discontinue posting their prices for a field, the Department will determine an index from the remaining posted prices. The Department reserves the right to include in the index determination the posted prices of additional fields.

5-1.16 AREAS FOR CONTRACTOR'S USE

Attention is directed to the provisions in Section 7-1.19, "Rights in Land and Improvements," of the Standard Specifications and these special provisions.

The highway right of way shall be used only for purposes that are necessary to perform the required work. The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work.

No State-owned parcels adjacent to the right of way are available for the exclusive use of the Contractor within the contract limits. The Contractor shall secure, at the Contractor's own expense, areas required for plant sites, storage of equipment or materials, or for other purposes.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on State property may be arranged with the Engineer, subject to the prior demands of State maintenance forces and to other contract requirements. Use of the Contractor's work areas and other State-owned property shall be at the Contractor's own risk, and the State shall not be held liable for damage to or loss of materials or equipment located within such areas.

5-1.17 PAYMENTS

Attention is directed to Sections 9-1.06, "Partial Payments," and 9-1.07, "Payment After Acceptance," of the Standard Specifications and these special provisions.

For the purpose of making partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications, the amount set forth for the contract items of work hereinafter listed shall be deemed to be the maximum value of the contract item of work which will be recognized for progress payment purposes:

- | | |
|--|-------------|
| A. Clearing and Grubbing | \$55,000.00 |
| D. Prepare Water Pollution Control Program | \$ 2,000.00 |

- | | |
|--|-------------|
| E. Prepare Storm Water Pollution Prevention Plan | \$ 3,000.00 |
| F. Progress Schedule (Critical Path Method) | \$ 2,000.00 |

After acceptance of the contract pursuant to the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, the amount, if any, payable for a contract item of work in excess of the maximum value for progress payment purposes hereinabove listed for the item, will be included for payment in the first estimate made after acceptance of the contract.

In determining the partial payments to be made to the Contractor, only the following listed materials will be considered for inclusion in the payment as materials furnished but not incorporated in the work:

- A. Piling
- B. Bar Reinforcing Steel

5-1.18 PROJECT INFORMATION

The information in this section has been compiled specifically for this project and is made available for bidders and Contractors. Other information referenced in the Standard Specifications and these special provisions do not appear in this section. The information is subject to the conditions and limitations set forth in Section 2-1.03, "Examination of Plans, Specifications, Contract, and Site of Work," and Section 6-2, "Local Materials," of the Standard Specifications. Bidders and Contractors shall be responsible for knowing the procedures for obtaining information.

Information attached to the project plans is as follows:

- A. Log of test borings.

Information included in the Information Handout provided to bidders and Contractors is as follows:

- A. Foundation recommendation.

Information available for inspection at the District Office is as follows:

- A. Cross sections.

Cross sections are available in paper or electronic copy.

The District Office in which the work is situated is located at 111 Grand Avenue, Oakland, California 94623.

5-1.19 SOUND CONTROL REQUIREMENTS

Sound control shall conform to the provisions in Section 7-1.01I, "Sound Control Requirements," of the Standard Specifications and these special provisions.

The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA at a distance of 15 m. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level.

The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

5-1.20 HIGHWAY CONSTRUCTION EQUIPMENT

The first paragraph of Section 7-1.01D, "Vehicle Code," of the Standard Specifications shall not apply.

Pursuant to the authority contained in Section 591 of the Vehicle Code, the Department has determined that, within such areas as are within the limits of the project and are open to public traffic, the following requirements of the Vehicle Code will apply: the lighting requirements in Section 25803; the brake requirements in Chapter 3, Division 12; the splash apron requirements in Section 27600; and, when operated on completed or existing treated base, surfacing, pavement or structures, except as otherwise provided in Section 7-1.02, "Load Limitations," of the Standard Specifications, the weight limitation requirements contained in 15.

5-1.21 MATERIAL SITES

Local material sites used by the Contractor shall be graded so that, at the time of final inspection of the contract, the sites will drain and will blend in with the surrounding terrain.

5-1.22 MATERIAL CONTAINING LEAD (Area 1)

This work shall consist of handling material containing lead in conformance with the Standard Specifications and these special provisions. Material within the project limits has not been designated or determined to contain aurally deposited lead. Material within the project limits does not require special disposal however, low levels of lead are present within the project limits.

Lead has been detected within the top 0.6 m (2 feet) of material in unpaved areas within the highway right of way. Levels of lead found within the project limits range from 2.0 to 34.98 mg/kg total lead as analyzed by EPA Test Method 6010 or EPA Test Method 7000 series with an average lead concentration of 34.98 mg/kg, as estimated by the 90% upper confidence limit.

After the Contractor has completed handling materials containing lead, in conformance with the plans, Standard Specifications, and these special provisions, the Contractor shall have no responsibility for such materials in place and shall not be obligated for further cleanup, removal, or remedial actions for such materials.

Handling material containing lead shall be in conformance with rules and regulations including, but not limited to, those of the following agencies:

California Division of Occupational Safety and Health Administration (Cal-OSHA)
California Regional Water Quality Control Board, San Francisco Bay Region

Full compensation for conforming to the requirements of this section, except for the Lead Compliance Plan, shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

LEAD COMPLIANCE PLAN

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling material containing lead. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Plan shall be submitted to the Engineer at least 7 days prior to beginning work in areas containing lead.

Prior to performing work in areas containing lead, personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor, that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

Personal protective equipment, training, and washing facilities, required by the Contractor's Lead Compliance Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 3.

The contract lump sum price paid for Lead Compliance Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Lead Compliance Plan, including paying the Certified Industrial Hygienist, and for providing personal protective equipment, training and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

5-1.23 AERIALY DEPOSITED LEAD (Area 2)

Aerially deposited lead is present within the project limits. Aerially deposited lead is lead deposited within unpaved areas or formerly unpaved areas, primarily due to vehicle emissions.

Attention is directed to "Material Containing Aerially Deposited Lead" and "Project Information" of these special provisions.

Portions of the site investigation report are included in the "Material Information" handout. The complete report, entitled "Hazardous Waste Site Investigation Report Task Order Number 04-130521-GS Contract Number 43A0078 880/238 Interchange Hayward, California," is available for inspection at the Department of Transportation, Duty Seniors Desk, 111 Grand Avenue, Oakland, CA – 510-286-5209.

Once the Contractor has completed the placement of material containing aerially deposited lead in conformance with these special provisions and as directed by the Engineer, the Contractor shall have no responsibility for such materials. The Department will not consider the Contractor a generator of such contaminated materials.

Excavation, reuse, and disposal of material with aerially deposited lead shall be in conformance with all rules and regulations including, but not limited to, those of the following agencies:

- A. United States Department of Transportation,
- B. United States Environmental Protection Agency,

- C. California Environmental Protection Agency,
- D. California Department of Health Services,
- E. Department of Toxic Substances Control,
- F. California Division of Occupational Safety and Health Administration,
- G. Integrated Waste Management Board,
- H. Regional Water Quality Control Board, San Francisco Bay Region,
- I. State Air Resources Control Board, and
- J. Bay Area Air Quality Management District.

Materials containing hazardous levels of lead shall be transported and disposed of in conformance with Federal and State laws and regulations, as amended, and county and municipal ordinances and regulations, as amended. Laws and regulations that govern this work include, but are not limited to:

- A. Health and Safety Code, Division 20, Chapter 6.5 (California Hazardous Waste Control Act),
- B. Title 22, California Code of Regulations, Division 4.5 (Environmental Health Standards for the Management of Hazardous Waste), and
- C. Title 8, California Code of Regulations.

5-1.24 RESTRICTED-MATERIAL, GENERAL (Area 3)

Attention is directed to "Earthwork" of these special provisions regarding the removal and disposal of restricted material. Attention is directed to Aerially Deposited Lead elsewhere in these special provisions.

Restricted (Type R) material has been discovered through testing within Area 3 of the project limits, shown on the plans. Testing consisted of collecting and analyzing in situ samples from within the limits of excavation shown on the plans. A description of the sampling plan, summary tables of the test results and portions of the site investigation report are included in the "Materials Information Handout". The complete report entitled "Hazardous Waste Site Investigation Report Task Order Number 04-130521-GS Contract Number 43A0078, 880/238 Interchange, San Leandro, California" is available for inspection at the Department of Transportation, Duty Senior's Desk. Requests to review the reports must be made with the Duty Senior at least 24 hours in advance. These test results have been used for disposal characterization of material within the project limits and shall not be construed as identifying all locations within the project limits that contain contaminants.

Within the context of this contract, the designation "restricted" shall apply to material with contaminant levels below the levels specified in the California Code of Regulations CCR Title 22 but with detectable contaminant levels that meet or exceed the contaminant levels specified in California Regional Water Quality Control Board, San Francisco Bay Region, Environmental Screening Levels (ESL).

The designation "restricted" shall also apply to material that will be stockpiled during construction for further testing by the Contractor in conformance with the receiving disposal facility.

The material designated as restricted is not regulated under the Resource Conservation and Recovery Act (RCRA). The levels of total petroleum hydrocarbons as motor oil (TPHmo) in the material will restrict disposal and shall be considered to be designated waste as defined by Chapter 15, Title 23 of the State of California Code of Regulations.

Wherever the following terms are used in the contract documents, the meaning and intent shall be interpreted as provided below:

Restricted material – Material that does not contain contaminants at concentrations equal to or greater than the threshold limit concentrations listed in Section 66261.24 of Title 22 of the California Code of Regulations.

All restricted materials on exteriors of transport vehicles shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the exclusion zone. No material shall be deposited on public roads. The Contractor shall indemnify the State from any costs due to spillage during the transport of the restricted material to the disposal facility.

Disposal of additional material resulting from the Contractor's option to slope the excavations in lieu of shoring at locations where this is possible or any excavation operations outside structure excavation pay limits will be at the Contractor's expense. This resultant material shall be treated as restricted if the test results for the location indicate that the material being excavated is restricted.

Characterization and disposal of additional material resulting from excavations performed outside of the pay limits shown on the plans, specified in the Standard Specifications, or specified or directed by the Engineer, for the Contractor's convenience, shall be at the Contractor's expense. This resultant material shall be presumed to be restricted material if the test results for the location indicate that the material being excavated is restricted material. The Contractor shall dispose of the resultant material in conformance with the provisions in "Earthwork" of these special provisions. When the material

must be removed from highway right of way, the Contractor shall furnish replacement material suitable for the purpose intended in conformance with the provisions in Section 19, "Earthwork," of the Standard Specifications.

APPLICABLE RULES AND REGULATIONS. --Excavation, transport and disposal of restricted material shall be in accordance with the rules and regulations of the following agencies:

- United States Department of Transportation (USDOT)
- United States Environmental Protection Agency (USEPA)
- California Environmental Protection Agency (CAL-EPA)
- 1. Department of Toxic Substance Control (DTSC) North Region
- 2. Integrated Waste Management Board
- 3. Regional Water Quality Control Board, Region 2 (RWQCB)
- 4. State Air Resources Board
- 5. Bay Area Air Quality Management District (BAAQMD)
- 6. California Division of Occupational Safety and Health Administration (CAL-OSHA)

PERMITS AND LICENSES. --The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the restricted material, in conformance with the provisions in Section 7-1.04, "Permits and Licenses," of the Standard Specifications. The Contractor shall provide Caltrans with copies of all agreements and permits controlling such work.

The Engineer will obtain the Environmental Protection Agency Generator Identification Number, as the State is the Generator.

SAMPLING AND ANALYSIS. --The Contractor shall test the material to be excavated at his own expense for any additional acceptance requirements put forth by the disposal facility. Sampling and analysis shall be performed using the sampling and analysis procedure required by the disposal facility.

The Contractor may perform additional tests on the material to be excavated at his option and expense for confirmation of the material classification as restricted. Sampling and analysis shall be the same or equivalent tests specified in the Materials Information Handout. The Contractor shall submit for approval by the Engineer, his sampling and analysis procedure and the name and address of the laboratory to be used fifteen (15) working days prior to beginning any sampling or analysis. The laboratory used shall be certified by the California Department of Health Services. Analytical results shall be sent by facsimile or hand delivered to the Engineer as soon as they are available. A summary report of sampling protocols, chain of custody, analysis and laboratory data sheets shall be supplied to the Engineer within 30 days of completion of sampling.

The Contractor shall test the material to be excavated for any additional acceptance requirements put forth by the disposal facility. Sampling and analysis shall be performed using the sampling and analysis procedure required by the disposal facility.

The Contractor may perform additional tests on the material to be excavated for confirmation of the classification as restricted material. Sampling and analysis shall be based on guidelines in USEPA, SW 846, "Test Methods for Evaluating Solid Waste, Volume II: Field Manual Physical/Chemical Methods."

The Contractor shall submit, for approval by the Engineer, a Sampling and Analysis Plan that describes the scope of the investigation, along with the name, address, and certification number of the testing laboratory fifteen (15) working days prior to beginning any sampling or analysis for additional disposal facility requirements, reclassification of material, or characterization of material outside of the excavation pay limits. The Sampling and Analysis Plan shall be prepared under the guidance of a registered professional experienced in site characterization. The Engineer will make the final decision on reclassification or characterization of material after review of the test data. Five (5) working days shall be allowed for review of test data. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

Operations shall be conducted in a manner that prevents increases in the quantities of restricted material resulting from mixing with material containing lower contaminant concentrations. No additional compensation will be made for material requiring reclassification due to failure to segregate the material after excavation.

MEASUREMENT AND PAYMENT

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

SECTION 6. (BLANK)

SECTION 7. (BLANK)

SECTION 8. MATERIALS

SECTION 8-1. MISCELLANEOUS

8-1.01 SUBSTITUTION OF NON-METRIC MATERIALS AND PRODUCTS

Only materials and products conforming to the requirements of the specifications shall be incorporated in the work. When metric materials and products are not available, and when approved by the Engineer, and at no cost to the State, materials and products in the United States Standard Measures which are of equal quality and of the required properties and characteristics for the purpose intended, may be substituted for the equivalent metric materials and products, subject to the following provisions:

- A. Materials and products shown on the plans or in the special provisions as being equivalent may be substituted for the metric materials and products specified or detailed on the plans.
- B. Before other non-metric materials and products will be considered for use, the Contractor shall furnish, at the Contractor's expense, evidence satisfactory to the Engineer that the materials and products proposed for use are equal to or better than the materials and products specified or detailed on the plans. The burden of proof as to the quality and suitability of substitutions shall be upon the Contractor and the Contractor shall furnish necessary information as required by the Engineer. The Engineer will be the sole judge as to the quality and suitability of the substituted materials and products and the Engineer's decision will be final.
- C. When the Contractor elects to substitute non-metric materials and products, including materials and products shown on the plans or in the special provisions as being equivalent, the list of sources of material specified in Section 6-1.01, "Source of Supply and Quality of Materials," of the Standard Specification shall include a list of substitutions to be made and contract items involved. In addition, for a change in design or details, the Contractor shall submit plans and working drawings in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. The plans and working drawings shall be submitted at least 7 days before the Contractor intends to begin the work involved.

Unless otherwise specified, the following substitutions of materials and products will be allowed:

SUBSTITUTION TABLE FOR PLAIN WIRE REINFORCEMENT

ASTM Designation: A 82

METRIC SIZE SHOWN ON THE PLANS mm ²	SIZE TO BE SUBSTITUTED inch ² x 100
MW9	W1.4
MW10	W1.6
MW13	W2.0
MW15	W2.3
MW19	W2.9
MW20	W3.1
MW22	W3.5
MW25	W3.9, except W3.5 in piles only
MW26	W4.0
MW30	W4.7
MW32	W5.0
MW35	W5.4
MW40	W6.2
MW45	W6.5
MW50	W7.8
MW55	W8.5, except W8.0 in piles only
MW60	W9.3
MW70	W10.9, except W11.0 in piles only
MW80	W12.4
MW90	W14.0
MW100	W15.5

SUBSTITUTION TABLE FOR BAR REINFORCEMENT

METRIC BAR DESIGNATION NUMBER ¹ SHOWN ON THE PLANS	BAR DESIGNATION NUMBER ² TO BE SUBSTITUTED
10	3
13	4
16	5
19	6
22	7
25	8
29	9
32	10
36	11
43	14
57	18

¹Bar designation numbers approximate the number of millimeters of the nominal diameter of the bars.

²Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars.

No adjustment will be required in spacing or total number of reinforcing bars due to a difference in minimum yield strength between metric and non-metric bars.

SUBSTITUTION TABLE FOR SIZES OF:

(1) STEEL FASTENERS FOR GENERAL APPLICATIONS (ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55), and

(2) HIGH STRENGTH STEEL FASTENERS (ASTM Designation: A 325 or A 449)

METRIC SIZE SHOWN ON THE PLANS mm	SIZE TO BE SUBSTITUTED inch
6 or 6.35	1/4
8 or 7.94	5/16
10 or 9.52	3/8
11 or 11.11	7/16
13, 12.70, or M12	1/2
14 or 14.29	9/16
16, 15.88, or M16	5/8
19, 19.05, or M20	3/4
22, 22.22, or M22	7/8
24, 25, 25.40, or M24	1
29, 28.58, or M27	1-1/8
32, 31.75, or M30	1-1/4
35 or 34.93	1-3/8
38, 38.10, or M36	1-1/2
44 or 44.45	1-3/4
51 or 50.80	2
57 or 57.15	2-1/4
64 or 63.50	2-1/2
70 or 69.85	2-3/4
76 or 76.20	3
83 or 82.55	3-1/4
89 or 88.90	3-1/2
95 or 95.25	3-3/4
102 or 101.60	4

SUBSTITUTION TABLE FOR NOMINAL THICKNESS OF SHEET METAL

UNCOATED HOT AND COLD ROLLED SHEETS		HOT-DIPPED ZINC COATED SHEETS (GALVANIZED)	
METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch	METRIC THICKNESS SHOWN ON THE PLANS mm	GAGE TO BE SUBSTITUTED inch
7.94	0.3125	4.270	0.1681
6.07	0.2391	3.891	0.1532
5.69	0.2242	3.510	0.1382
5.31	0.2092	3.132	0.1233
4.94	0.1943	2.753	0.1084
4.55	0.1793	2.372	0.0934
4.18	0.1644	1.994	0.0785
3.80	0.1495	1.803	0.0710
3.42	0.1345	1.613	0.0635
3.04	0.1196	1.461	0.0575
2.66	0.1046	1.311	0.0516
2.28	0.0897	1.158	0.0456
1.90	0.0747	1.006 or 1.016	0.0396
1.71	0.0673	0.930	0.0366
1.52	0.0598	0.853	0.0336
1.37	0.0538	0.777	0.0306
1.21	0.0478	0.701	0.0276
1.06	0.0418	0.627	0.0247
0.91	0.0359	0.551	0.0217
0.84	0.0329	0.513	0.0202
0.76	0.0299	0.475	0.0187
0.68	0.0269	-----	-----
0.61	0.0239	-----	-----
0.53	0.0209	-----	-----
0.45	0.0179	-----	-----
0.42	0.0164	-----	-----
0.38	0.0149	-----	-----

SUBSTITUTION TABLE FOR WIRE

METRIC THICKNESS SHOWN ON THE PLANS mm	WIRE THICKNESS TO BE SUBSTITUTED inch	GAGE NO.
6.20	0.244	3
5.72	0.225	4
5.26	0.207	5
4.88	0.192	6
4.50	0.177	7
4.11	0.162	8
3.76	0.148	9
3.43	0.135	10
3.05	0.120	11
2.69	0.106	12
2.34	0.092	13
2.03	0.080	14
1.83	0.072	15
1.57	0.062	16
1.37	0.054	17
1.22	0.048	18
1.04	0.041	19
0.89	0.035	20

SUBSTITUTION TABLE FOR PIPE PILES

METRIC SIZE SHOWN ON THE PLANS mm x mm	SIZE TO BE SUBSTITUTED inch x inch
PP 360 x 4.55	NPS 14 x 0.179
PP 360 x 6.35	NPS 14 x 0.250
PP 360 x 9.53	NPS 14 x 0.375
PP 360 x 11.12	NPS 14 x 0.438
PP 406 x 12.70	NPS 16 x 0.500
PP 460 x T	NPS 18 x T"
PP 508 x T	NPS 20 x T"
PP 559 x T	NPS 22 x T"
PP 610 x T	NPS 24 x T"
PP 660 x T	NPS 26 x T"
PP 711 x T	NPS 28 x T"
PP 762 x T	NPS 30 x T"
PP 813 x T	NPS 32 x T"
PP 864 x T	NPS 34 x T"
PP 914 x T	NPS 36 x T"
PP 965 x T	NPS 38 x T"
PP 1016 x T	NPS 40 x T"
PP 1067 x T	NPS 42 x T"
PP 1118 x T	NPS 44 x T"
PP 1219 x T	NPS 48 x T"
PP 1524 x T	NPS 60 x T"

The thickness in millimeters (T) represents an exact conversion of the thickness in inches (T").

SUBSTITUTION TABLE FOR CIDH CONCRETE PILING

METRIC SIZE SHOWN ON THE PLANS	ACTUAL AUGER SIZE TO BE SUBSTITUTED inches
350 mm	14
400 mm	16
450 mm	18
600 mm	24
750 mm	30
900 mm	36
1.0 m	42
1.2 m	48
1.5 m	60
1.8 m	72
2.1 m	84
2.4 m	96
2.7 m	108
3.0 m	120
3.3 m	132
3.6 m	144
4.0 m	156

SUBSTITUTION TABLE FOR STRUCTURAL TIMBER AND LUMBER

METRIC MINIMUM DRESSED DRY, SHOWN ON THE PLANS mm x mm	METRIC MINIMUM DRESSED GREEN, SHOWN ON THE PLANS mm x mm	NOMINAL SIZE TO BE SUBSTITUTED inch x inch
19x89	20x90	1x4
38x89	40x90	2x4
64x89	65x90	3x4
89x89	90x90	4x4
140x140	143x143	6x6
140x184	143x190	6x8
184x184	190x190	8x8
235x235	241x241	10x10
286x286	292x292	12x12

SUBSTITUTION TABLE FOR NAILS AND SPIKES

METRIC COMMON NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC BOX NAIL, SHOWN ON THE PLANS Length, mm Diameter, mm	METRIC SPIKE, SHOWN ON THE PLANS Length, mm Diameter, mm	SIZE TO BE SUBSTITUTED Penny-weight
50.80 2.87	50.80 2.51	————	6d
63.50 3.33	63.50 2.87	————	8d
76.20 3.76	76.20 3.25	76.20 4.88	10d
82.55 3.76	82.55 3.25	82.55 4.88	12d
88.90 4.11	88.90 3.43	88.90 5.26	16d
101.60 4.88	101.60 3.76	101.60 5.72	20d
114.30 5.26	114.30 3.76	114.30 6.20	30d
127.00 5.72	127.00 4.11	127.00 6.68	40d
————	————	139.70 7.19	50d
————	————	152.40 7.19	60d

**SUBSTITUTION TABLE FOR IRRIGATION
COMPONENTS**

METRIC WATER METERS, TRUCK LOADING STANDPIPES, VALVES, BACKFLOW PREVENTERS, FLOW SENSORS, WYE STRAINERS, FILTER ASSEMBLY UNITS, PIPE SUPPLY LINES, AND PIPE IRRIGATION SUPPLY LINES SHOWN ON THE PLANS DIAMETER NOMINAL (DN) mm	NOMINAL SIZE TO BE SUBSTITUTED inch
15	1/2
20	3/4
25	1
32	1-1/4
40	1-1/2
50	2
65	2-1/2
75	3
100	4
150	6
200	8
250	10
300	12
350	14
400	16

Unless otherwise specified, substitutions of United States Standard Measures standard structural shapes corresponding to the metric designations shown on the plans and in conformance with the requirements in ASTM Designation: A 6/A 6M, Annex 2, will be allowed.

8-1.02 PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS

The Department maintains the following list of Prequalified and Tested Signing and Delineation Materials. The Engineer shall not be precluded from sampling and testing products on the list of Prequalified and Tested Signing and Delineation Materials.

The manufacturer of products on the list of Prequalified and Tested Signing and Delineation Materials shall furnish the Engineer a Certificate of Compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each type of traffic product supplied.

For those categories of materials included on the list of Prequalified and Tested Signing and Delineation Materials, only those products shown within the listing may be used in the work. Other categories of products, not included on the list of Prequalified and Tested Signing and Delineation Materials, may be used in the work provided they conform to the requirements of the Standard Specifications.

Materials and products may be added to the list of Prequalified and Tested Signing and Delineation Materials if the manufacturer submits a New Product Information Form to the New Product Coordinator at the Transportation Laboratory. Upon a Departmental request for samples, sufficient samples shall be submitted to permit performance of required tests. Approval of materials or products will depend upon compliance with the specifications and tests the Department may elect to perform.

PAVEMENT MARKERS, PERMANENT TYPE

Retroreflective With Abrasion Resistant Surface (ARS)

- A. Apex, Model 921AR (100 mm x 100 mm)
- B. Avery Dennison, Models C88 (100 mm x 100 mm), 911 (100 mm x 100 mm) and 953 (70 mm x 114 mm)
- C. Ray-O-Lite, Model "AA" ARS (100 mm x 100 mm)
- D. 3M Series 290 (89 mm x 100 mm)
- E. 3M Series 290 PSA, with pressure sensitive adhesive pad (89 mm x 100 mm)

Retroreflective With Abrasion Resistant Surface (ARS)

(for recessed applications only)

- A. Avery Dennison, Model 948 (58 mm x 119 mm)
- B. Avery Dennison, Model 944SB (51 mm x 100 mm)*
- C. Ray-O-Lite, Model 2002 (58 mm x 117 mm)
- D. Ray-O-Lite, Model 2004 ARS (51 mm x 100 mm)*

*For use only in 114 mm wide (older) recessed slots

Non-Reflective, 100 mm Round

- A. Apex Universal (Ceramic)
- B. Apex Universal, Models 929 (ABS) and 929PP (Polypropylene)
- C. Glowlite, Inc., (Ceramic)
- D. Hi-Way Safety, Inc., Models P20-2000W and 2001Y (ABS)
- E. Interstate Sales, "Diamond Back" (ABS) and (Polypropylene)
- F. Novabrite Models Cdot (White) Cdot-y (Yellow), Ceramic
- G. Novabrite Models Pdot-w (White) Pdot-y (Yellow), Polypropylene
- H. Road Creations, Model RCB4NR (Acrylic)
- I. Three D Traffic Works TD10000 (ABS), TD10500 (Polypropylene)

PAVEMENT MARKERS, TEMPORARY TYPE

Temporary Markers For Long Term Day/Night Use (6 months or less)

- A. Vega Molded Products "Temporary Road Marker" (75 mm x 100 mm)

Temporary Markers For Short Term Day/Night Use (14 days or less)

(For seal coat or chip seal applications, clear protective covers are required)

- A. Apex Universal, Model 932
- B. Bunzl Extrusion, Models T.O.M., T.R.P.M., and "HH" (High Heat)
- C. Hi-Way Safety, Inc., Model 1280/1281
- D. Glowlite, Inc., Model 932

STRIPING AND PAVEMENT MARKING MATERIAL

Permanent Traffic Striping and Pavement Marking Tape

- A. Advanced Traffic Marking, Series 300 and 400
- B. Brite-Line, Series 1000
- C. Brite-Line, "DeltaLine XRP"
- D. Swarco Industries, "Director 35" (For transverse application only)
- E. Swarco Industries, "Director 60"
- F. 3M, "Stamark" Series 380 and 5730
- G. 3M, "Stamark" Series 420 (For transverse application only)

Temporary (Removable) Striping and Pavement Marking Tape (6 months or less)

- A. Advanced Traffic Marking, Series 200
- B. Brite-Line, Series 100
- C. Garlock Rubber Technologies, Series 2000
- D. P.B. Laminations, Aztec, Grade 102
- E. Swarco Industries, "Director-2"
- F. Trelleborg Industri, R140 Series
- G. 3M, Series 620 "CR", and Series A750

- H. 3M, Series A145, Removable Black Line Mask
(Black Tape: for use only on Asphalt Concrete Surfaces)
- I. Advanced Traffic Marking Black "Hide-A-Line"
(Black Tape: for use only on Asphalt Concrete Surfaces)
- J. Brite-Line "BTR" Black Removable Tape
(Black Tape: for use only on Asphalt Concrete Surfaces)
- K. Trelleborg Industri, RB-140
(Black Tape: for use only on Asphalt Concrete Surfaces)

Preformed Thermoplastic (Heated in place)

- A. Avery Dennison, "Hotape"
- B. Flint Trading, "Premark," "Premark 20/20 Flex," and "Premark 20/20 Flex Plus"

Ceramic Surfacing Laminate, 150 mm x 150 mm

- A. Highway Ceramics, Inc.

CLASS 1 DELINEATORS

One Piece Driveable Flexible Type, 1700 mm

- A. Bunzl Extrusion, "Flexi-Guide Models 400 and 566"
- B. Carsonite, Curve-Flex CFRM-400
- C. Carsonite, Roadmarker CRM-375
- D. FlexStake, Model 654 TM
- E. GreenLine Models HWD1-66 and CGD1-66

Special Use Type, 1700 mm

- A. Bunzl Extrusion, Model FG 560 (with 450 mm U-Channel base)
- B. Carsonite, "Survivor" (with 450 mm U-Channel base)
- C. Carsonite, Roadmarker CRM-375 (with 450 mm U-Channel base)
- D. FlexStake, Model 604
- E. GreenLine Models HWDU and CGD (with 450 mm U-Channel base)
- F. Impact Recovery Model D36, with #105 Driveable Base
- G. Safe-Hit with 200 mm pavement anchor (SH248-GP1)
- H. Safe-Hit with 380 mm soil anchor (SH248-GP2) and with 450 mm soil anchor (SH248-GP3)

Surface Mount Type, 1200 mm

- A. Bent Manufacturing Company, Masterflex Model MF-180EX-48
- B. Carsonite, "Super Duck II"
- C. FlexStake, Surface Mount, Models 704 and 754 TM
- D. Impact Recovery Model D48, with #101 Fixed (Surface-Mount) Base
- E. Three D Traffic Works "Channelflex" ID No. 522248W

CHANNELIZERS

Surface Mount Type, 900 mm

- A. Bent Manufacturing Company, Masterflex Models MF-360-36 (Round) and MF-180-36 (Flat)
- B. Bunzl Extrusion, Flexi-Guide Models FG300PE and FG300UR
- C. Carsonite, "Super Duck" (Flat SDF-436, Round SDR-336)
- D. Carsonite, "Super Duck II" Model SDCF203601MB "The Channelizer"
- E. FlexStake, Surface Mount, Models 703 and 753 TM
- F. GreenLine, Model SMD-36
- G. Hi-Way Safety, Inc. "Channel Guide Channelizer" Model CGC36
- H. Impact Recovery Model D36, with #101 Fixed (Surface-Mount) Base
- I. Repo, Models 300 and 400
- J. Safe-Hit, Guide Post, Model SH236SMA
- K. Three D Traffic Works "Channelflex" ID No. 522053W

Lane Separation System

- A. Bunzl "Flexi-Guide (FG) 300 Curb System"

- B. Qwick Kurb, "Klemmfix Guide System"
- C. Recycled Technology, Inc. "Safe-Lane System"

CONICAL DELINEATORS, 1070 mm

(For 700 mm Traffic Cones, see Standard Specifications)

- A. Bent Manufacturing Company "T-Top"
- B. Plastic Safety Systems "Navigator-42"
- C. Radiator Specialty Company "Enforcer"
- D. Roadmaker Company "Stacker"
- E. TrafFix Devices "Grabber"
- F. Three D Traffic Works "Ringtop" TD7000, ID No. 742143

OBJECT MARKERS

Type "K", 450 mm

- A. Bunzl, Model FG318PE
- B. Carsonite, Model SMD 615
- C. FlexStake, Model 701 KM
- D. Repo, Models 300 and 400
- E. Safe-Hit, Model SH718SMA

Type "K-4" / "Q" Object Markers, 600 mm

- A. Bent Manufacturing "Masterflex" Model MF-360-24
- B. Bunzl Extrusion, Model FG324PE
- C. Carsonite, Super Duck II
- D. FlexStake, Model 701KM
- E. Repo, Models 300 and 400
- F. Safe-Hit, Models SH8 24SMA_WA and SH8 24GP3_WA
- G. The Line Connection, Model DP21-4Q
- H. Three D Traffic Works "Q" Marker, ID No. 531702W

CONCRETE BARRIER MARKERS AND TEMPORARY RAILING (TYPE K) REFLECTORS

Impactable Type

- A. ARTUK, "FB"
- B. Bunzl Extrusion, Models PCBM-12 and PCBM-T12
- C. Duraflex Corp., "Flexx 2020" and "Electriflexx"
- D. Hi-Way Safety, Inc., Model GMKRM100
- E. Plastic Safety Systems "BAM" Models OM-BARR and OM-BWAR
- F. Sun-Lab Technology, "Safety Guide Light Model TM-5"
- G. Three D Traffic Works "Roadguide" 9304 Series, ID No. 903176 (One-Way), ID No. 903215 (Two-Way)

Non-Impactable Type

- A. ARTUK, JD Series
- B. Plastic Safety Systems "BAM" Models OM-BITARW and OM-BITARA
- C. Vega Molded Products, Models GBM and JD

METAL BEAM GUARD RAIL POST MARKERS

(For use to the left of traffic)

- A. Bunzl Extrusion, "Mini" (75 mm x 254 mm)
- B. Creative Building Products, "Dura-Bull, Model 11201"
- C. Duraflex Corp., "Railrider"

CONCRETE BARRIER DELINEATORS, 400 mm

(For use to the right of traffic)

- A. Bunzl Extrusion, Model PCBM T-16
- B. Safe-Hit, Model SH216RBM
- C. Sun-Lab Technology, "Safety Guide Light, Model TM16," (75 mm x 300 mm)
- D. Three D Traffic Works "Roadguide" ID No. 904364 (White), ID No. 904390 (Yellow)

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CONCRETE BARRIER-MOUNTED MINI-DRUM (260 mm x 360 mm x 570 mm)

- A. Stinson Equipment Company "SaddleMarker"

SOUND WALL DELINEATOR

(Applied vertically. Place top of 75 mm x 300 mm reflective element at 1200 mm above roadway)

- A. Bunzl Extrusion, PCBM S-36
- B. Sun-Lab Technology, "Safety Guide Light, Model SM12," (75 mm x 300 mm)

GUARD RAILING DELINEATOR

(Place top of reflective element at 1200 mm above plane of roadway)

Wood Post Type, 686 mm

- A. Bunzl Extrusion, FG 427 and FG 527
- B. Carsonite, Model 427
- C. FlexStake, Model 102 GR
- D. GreenLine GRD 27
- E. Safe-Hit, Model SH227GRD
- F. Three D Traffic Works "Guardflex" TD9100 Series, ID No. 510476

Steel Post Type

- A. Carsonite, Model CFGR-327 with CFGRBK300 Mounting Bracket

RETROREFLECTIVE SHEETING

Channelizers, Barrier Markers, and Delineators

- A. Avery Dennison T-6500 Series (For rigid substrate devices only)
- B. Avery Dennison WR-6100 Series
- C. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
- D. Reflexite, PC-1000 Metalized Polycarbonate
- E. Reflexite, AC-1000 Acrylic
- F. Reflexite, AP-1000 Metalized Polyester
- G. Reflexite, Conformalight, AR-1000 Abrasion Resistant Coating
- H. 3M, High Intensity

Traffic Cones, 330 mm Sleeves

- A. Reflexite SB (Polyester), Vinyl or "TR" (Semi-transparent)

Traffic Cones, 100 mm and 150 mm Sleeves

- A. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
- B. Reflexite, Vinyl, "TR" (Semi-transparent) or "Conformalight"
- C. 3M Series 3840

Barrels and Drums

- A. Avery Dennison WR-6100
- B. Nippon Carbide Industries, Flexible Ultralite Grade (ULG) II
- C. Reflexite, "Conformalight", "Super High Intensity" or "High Impact Drum Sheeting"
- D. 3M Series 3810

Barricades: Type I, Medium-Intensity (Typically Enclosed Lens, Glass-Bead Element)

- A. American Decal, Adcolite
- B. Avery Dennison, T-1500 and T-1600 series
- C. 3M Engineer Grade, Series 3170

Barricades: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

- A. Avery Dennison, T-2500 Series
- B. Kiwalite Type II
- C. Nikkalite 1800 Series

Signs: Type II, Medium-High-Intensity (Typically Enclosed Lens, Glass-Bead Element)

- A. Avery Dennison, T-2500 Series
- B. Kiwalite, Type II
- C. Nikkalite 1800 Series

Signs: Type III, High-Intensity (Typically Encapsulated Glass-Bead Element)

- A. Avery Dennison, T-5500 and T-5500A Series
- B. Nippon Carbide Industries, Nikkalite Brand Ultralite Grade II
- C. 3M Series 3870

Signs: Type IV, High-Intensity (Typically Unmetallized Microprismatic Element)

- A. Avery Dennison, T-6500 Series
- B. Nippon Carbide Industries, Crystal Grade, 94000 Series
- C. Nippon Carbide Industries, Model No. 94847 Fluorescent Orange
- D. Nippon Carbide Industries, Model No. 94844 Fluorescent Yellow Green

Signs: Type VI, Elastomeric (Roll-Up) High-Intensity, without Adhesive

- A. Avery Dennison, WU-6014
- B. Novabrite LLC, "Econobrite"
- C. Reflexite "Vinyl"
- D. Reflexite "SuperBright"
- E. Reflexite "Marathon"
- F. 3M Series RS34 Orange and RS20 Fluorescent Orange

Signs: Type VII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

- A. 3M LDP Series 3924 Fluorescent Orange
- B. 3M LDP Series 3970

Signs: Type VIII, Super-High-Intensity (Typically Unmetallized Microprismatic Element)

- A. Avery Dennison, T-7500 Series
- B. Avery Dennison, T-7511 Fluorescent Yellow
- C. Avery Dennison, T-7513 Fluorescent Yellow Green
- D. Avery Dennison, W-7514 Fluorescent Orange
- E. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92802 White
- F. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92844 Fluorescent Yellow/Green
- G. Nippon Carbide Industries, Nikkalite Crystal Grade Model 92847 Fluorescent Orange

Signs: Type IX, Very-High-Intensity (Typically Unmetallized Microprismatic Element)

- A. 3M VIP Series 3981 Diamond Grade Fluorescent Yellow
- B. 3M VIP Series 3983 Diamond Grade Fluorescent Yellow/Green
- C. 3M VIP Series 3990 Diamond Grade

SPECIALTY SIGNS

- A. Hallmark Technologies, Inc., All Sign STOP Sign (All Plastic), 750 mm
- B. Reflexite "Endurance" Work Zone Sign (with Semi-Rigid Plastic Substrate)

SIGN SUBSTRATE

Fiberglass Reinforced Plastic (FRP)

- A. Fiber-Brite
- B. Sequentia, "Polyplate"
- C. Inteplast Group "InteCel" (13 mm for Post-Mounted CZ Signs, 1200 mm or less)

Aluminum Composite

- A. Alcan Composites "Dibond Material, 2 mm" (for temporary construction signs only)
- B. Mitsubishi Chemical America, Alpolic 350 (for temporary construction signs only)

8-1.03 STATE-FURNISHED MATERIALS

Attention is directed to Section 6-1.02, "State-Furnished Materials," of the Standard Specifications and these special provisions.

The following materials will be furnished to the Contractor:

- A. Sign panels for roadside signs.
- B. Mast arm sign hanger assemblies
- C. Padlocks for irrigation controller enclosure cabinets.
- D. Light emitting diode (LED) signal modules for vehicular traffic signal units and ramp metering system and Type A pedestrian signals.
- E. Loop detector sensor units.
- F. Drums and lubricating material for testing the lubrication system.
- G. Padlocks for the backflow preventer assembly enclosure, backflow preventer assembly blanket, and irrigation controller enclosure cabinet will be furnished to the Contractor.
- H. Padlock for fire sprinkler main shut-off valve." and "
- I. Sufficient quantities of lubricants, oils, and fluids for testing the respective systems.

The Contractor shall notify the Engineer not less than 72 hours before State-furnished material is to be picked up by the Contractor. A full description of the material and the time the material will be picked up shall be provided. The number, type, and size of the sign panels, and the contract number shall also be provided to the District Warehouse Manager.

8-1.04 ENGINEERING FABRICS

Engineering fabrics shall conform to the provisions in Section 88, "Engineering Fabrics," of the Standard Specifications and these special provisions.

Filter fabric for this project shall be ultraviolet (UV) ray protected.

SECTION 8-2. CONCRETE

8-2.01 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the provisions in Section 90, "Portland Cement Concrete," of the Standard Specifications and these special provisions.

References to Section 90-2.01, "Portland Cement," of the Standard Specifications shall mean Section 90-2.01, "Cement," of the Standard Specifications.

Mineral admixture shall be combined with cement in conformance with the provisions in Section 90-4.08, "Required Use of Mineral Admixtures," of the Standard Specifications for the concrete materials specified in Section 56-2, "Roadside Signs," of the Standard Specifications.

The requirements of Section 90-4.08, "Required Use of Mineral Admixture," of the Standard Specifications shall not apply to Section 19-3.025C, "Soil Cement Bedding," of the Standard Specifications.

The Department maintains a list of sources of fine and coarse aggregate that have been approved for use with a reduced amount of mineral admixture in the total amount of cementitious material to be used. A source of aggregate will be considered for addition to the approved list if the producer of the aggregate submits to the Transportation Laboratory certified test results from a qualified testing laboratory that verify the aggregate complies with the requirements. Prior to starting the testing, the aggregate test shall be registered with the Department. A registration number can be obtained by calling (916) 227-7228. The registration number shall be used as the identification for the aggregate sample in correspondence with the Department. Upon request, a split of the tested sample shall be provided to the Department. Approval of aggregate will depend upon compliance with the specifications, based on the certified test results submitted, together with any replicate testing the Department may elect to perform. Approval will expire 3 years from the date the most recent registered and evaluated sample was collected from the aggregate source.

Qualified testing laboratories shall conform to the following requirements:

- A. Laboratories performing ASTM Designation: C 1293 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Concrete Proficiency Sample Program and shall have received a score of 3 or better on all tests of the previous 2 sets of concrete samples.
- B. Laboratories performing ASTM Designation: C 1260 shall participate in the Cement and Concrete Reference Laboratory (CCRL) Pozzolan Proficiency Sample Program and shall have received a score of 3 or better on the shrinkage and soundness tests of the previous 2 sets of pozzolan samples.

Aggregates on the list shall conform to one of the following requirements:

- A. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1293, the average expansion at one year shall be less than or equal to 0.040 percent; or
- B. When the aggregate is tested in conformance with the requirements in California Test 554 and ASTM Designation: C 1260, the average of the expansion at 16 days shall be less than or equal to 0.15 percent.

The amounts of cement and mineral admixture used in cementitious material shall be sufficient to satisfy the minimum cementitious material content requirements specified in Section 90-1.01, "Description," or Section 90-4.05, "Optional Use of Chemical Admixtures," of the Standard Specifications and shall conform to the following:

- A. The minimum amount of cement shall not be less than 75 percent by mass of the specified minimum cementitious material content.
- B. The minimum amount of mineral admixture to be combined with cement shall be determined using one of the following criteria:
 - 1. When the calcium oxide content of a mineral admixture is equal to or less than 2 percent by mass, the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
 - 2. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass, and any of the aggregates used are not listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 25 percent by mass of the total amount of cementitious material to be used in the mix.
 - 3. When the calcium oxide content of a mineral admixture is greater than 2 percent by mass and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 15 percent by mass of the total amount of cementitious material to be used in the mix.
 - 4. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used, the amount of mineral admixture shall not be less than 10 percent by mass of the total amount of cementitious material to be used in the mix.
 - 5. When a mineral admixture that conforms to the provisions for silica fume in Section 90-2.04, "Admixture Materials," of the Standard Specifications is used and the fine and coarse aggregates are listed on the approved list as specified in these special provisions, then the amount of mineral admixture shall not be less than 7 percent by mass of the total amount of cementitious material to be used in the mix.
- C. The total amount of mineral admixture shall not exceed 35 percent by mass of the total amount of cementitious material to be used in the mix. Where Section 90-1.01, "Description," of the Standard Specifications specifies a maximum cementitious content in kilograms per cubic meter, the total mass of cement and mineral admixture per cubic meter shall not exceed the specified maximum cementitious material content.

The Contractor will be permitted to use Type III portland cement for concrete used in the manufacture of precast concrete members.

8-2.02 PRECAST CONCRETE QUALITY CONTROL

GENERAL

Precast concrete quality control shall conform to these special provisions.

Unless otherwise specified, precast concrete quality control shall apply when any precast concrete members are fabricated in conformance with the provisions in Section 49, "Piling," or Section 51, "Concrete Structures," of the Standard Specifications.

Quality Control (QC) shall be the responsibility of the Contractor. The Contractor's QC inspectors shall perform inspection and testing prior to precasting, during precasting, and after precasting, and as specified in this section and additionally as necessary to ensure that materials and workmanship conform to the details shown on the plans and specifications.

Quality Assurance (QA) is the prerogative of the Engineer. Regardless of the acceptance for a given precast element by the Contractor, the Engineer will evaluate the precast element. The Engineer will reject any precast element that does not conform to the approved Precast Concrete Quality Control Plan (PCQCP), the details shown on the plans, and these special provisions.

The Contractor shall designate in writing a precast Quality Control Manager (QCM) for each precasting facility. The QCM shall be responsible directly to the Contractor for the quality of precasting, including materials and workmanship, performed by the Contractor and all subcontractors. The QCM shall be the sole individual responsible to the Contractor for submitting, receiving, and approving all correspondence, required submittals, and reports to and from the Engineer. The QCM shall not be employed or compensated by any subcontractor, or other persons or entities hired by subcontractors, or suppliers, who will provide other services or materials for the project. The QCM may be an employee of the Contractor.

Prior to submitting the PCQCP required herein, a meeting between the Engineer, the Contractor's QCM, and a representative from each entity performing precast concrete operations for this project, shall be held to discuss the requirements for precast quality control.

QC Inspectors shall either be 1) licensed as Civil Engineers in the State of California, or 2) have a current Plant Quality Personnel Certification, Level II, from the Precast/Prestressed Concrete Institute. A QC Inspector shall witness all precast concrete operations.

PRECAST CONCRETE QUALIFICATION AUDIT

Unless otherwise specified, no Contractors or subcontractors performing precast concrete operations for the project shall commence work without having successfully completed the Department's Precast Fabrication Qualification Audit, hereinafter referred to as the audit. The Engineer will perform the audit, and copies of the audit form, along with procedures for requesting and completing the audit, are available at the Transportation Laboratory or the following website:

<http://www.dot.ca.gov/hq/esc/Translab/smbresources.htm>

An audit that was previously approved by the Engineer no more than three years prior to the beginning of work on this contract will be acceptable for the entire period of this contract, provided the Engineer determines the audit is for the same type of work that is to be performed on this contract.

Successful completion of an audit shall not relieve the Contractor of the responsibility for furnishing materials or producing finished work of the quality specified in these special provisions and as shown on the plans.

PRECAST CONCRETE QUALITY CONTROL PLAN

Prior to performing any precasting operations, the Contractor shall submit to the Engineer, in conformance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications, 3 copies of a separate PCQCP for each item of work which is to be precast. A separate PCQCP shall be submitted for each facility. As a minimum, each PCQCP shall include the following:

- A. The name of the precasting firm, the concrete plants to be used, and any concrete testing firm to be used;
- B. A manual prepared by the precasting firm that includes equipment, testing procedures, safety plan, and the names, qualifications, and documentation of certifications for all personnel to be used;
- C. The name of the QCM and the names, qualifications, and documentation of certifications for all QC inspection personnel to be used;
- D. An organizational chart showing all QC personnel and their assigned QC responsibilities;
- E. The methods and frequencies for performing all required quality control procedures, including all inspections, material testing, and any required survey procedures for all components of the precast elements including prestressing systems, concrete, grout, reinforcement, steel components embedded or attached to the precast member, miscellaneous metal, and formwork;
- F. A system for identification and tracking of required precast element repairs, and a procedure for the re-inspection of any repaired precast element. The system shall have provisions for a method of reporting nonconforming precast elements to the Engineer; and
- G. Forms to be used for Certificates of Compliance, daily production logs, and daily reports.

The Engineer shall have 4 weeks to review the PCQCP submittal after a complete plan has been received. No precasting shall be performed until the PCQCP is approved in writing by the Engineer.

A PCQCP that was previously approved by the Engineer no more than one year prior to the beginning of work on this contract will be acceptable for the entire period of this contract, provided the Engineer determines the PCQCP is for the same type of work that is to be performed on this contract.

An amended PCQCP or addendum shall be submitted to, and approved in writing by the Engineer, for any proposed revisions to the approved PCQCP. An amended PCQCP or addendum will be required for any revisions to the PCQCP, including but not limited to changes in concrete plants or source materials, changes in material testing procedures and testing labs, changes in procedures and equipment, changes in QC personnel, or updated systems for tracking and identifying precast elements. The Engineer shall have 2 weeks to complete the review of the amended PCQCP or addendum, once a complete

submittal has been received. Work that is affected by any of the proposed revisions shall not be performed until the amended PCQCP or addendum has been approved.

After final approval of the PCQCP, amended PCQCP, or addendum, the Contractor shall submit 7 copies to the Engineer of each of these approved documents.

It is expressly understood that the Engineer's approval of the Contractor's PCQCP shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications. The Engineer's approval shall neither constitute a waiver of any of the requirements of the plans and specifications nor relieve the Contractor of any obligation thereunder, and defective work, materials, and equipment may be rejected notwithstanding approval of the PCQCP.

REPORTING

The QC Inspector shall provide reports to the QCM on a daily basis for each day that precasting operations are performed.

A daily production log for precasting shall be kept by the QCM for each day that precasting operations, including setting forms, placing reinforcement, setting prestressing steel, casting, curing, post tensioning, and form release, are performed. The log shall include the facility location, and shall include specific description of casting or related operations, any problems or deficiencies discovered, any testing or repair work performed, and the names of all QC personnel and the specific QC inspections they performed that day. The daily report from each QC Inspector shall also be included in the log. This daily log shall be available for viewing by the Engineer, at the precasting facility.

All reports regarding material tests and any required survey checks shall be signed by the person that performed the test or check, and then submitted directly to the QCM for review and signature prior to submittal to the Engineer. Corresponding names shall be clearly printed or typewritten next to all signatures.

The Engineer shall be notified immediately in writing when any precasting problems or deficiencies are discovered and also of the proposed repair or process changes required to correct them. The Engineer shall have 4 weeks to review these procedures. No remedial work shall begin until the Engineer approves these procedures in writing.

The following items shall be included in a Precast Report that is to be submitted to the Engineer following the completion of any precast element:

- A. Reports of all material tests and any required survey checks;
- B. Documentation that the Contractor has evaluated all tests and corrected all rejected deficiencies, and all repairs have been re-examined with the required tests and found acceptable; and
- C. Daily production log.

At the completion of any precast element, and if the QCM determines that element is in conformance with these special provisions, the QCM shall sign and furnish to the Engineer, a certificate of compliance in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. This certificate of compliance shall be submitted with the Precast Report. The certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in conformance with the details shown on the plans and the provisions of the Standard Specifications and these special provisions.

PAYMENT

In the event the Engineer fails to complete the review of 1) a PCQCP, 2) an amended PCQCP or addendum, or 3) a proposed repair or process change, within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All required repair work or process changes required to correct precasting operation deficiencies, whether discovered by the QCM, QC Inspector, or by the Engineer, and any associated delays or expenses to the Contractor caused by performing these repairs, shall be at the Contractor's expense.

Full compensation for conforming to the requirements of this section shall be considered as included in the contract prices paid for the various items of work involved, and no additional compensation will be allowed therefor.

SECTION 8-3. WELDING

8-3.01 WELDING

GENERAL

Flux core welding electrodes conforming to the requirements of AWS A5.20 E6XT-4 or E7XT-4 shall not be used to perform welding for this project.

Wherever reference is made to the following AWS welding codes in the Standard Specifications, on the plans, or in these special provisions, the year of adoption for these codes shall be as listed:

AWS Code	Year of Adoption
D1.1	2002
D1.4	1998
D1.5	2002
D1.6	1999

Requirements of the AWS welding codes shall apply unless specified otherwise in the Standard Specifications, on the plans, or in these special provisions. Wherever the abbreviation AWS is used, it shall be equivalent to the abbreviations ANSI/AWS or AASHTO/AWS.

Section 6.1.1.1 of AWS D1.5 is replaced with the following:

Quality Control (QC) shall be the responsibility of the Contractor. As a minimum, the Contractor shall perform inspection and testing of each weld joint prior to welding, during welding, and after welding as specified in this section and as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

Sections 6.1.3 through 6.1.4.3 of AWS D1.1, Section 7.1.2 of AWS D1.4, and Sections 6.1.1.2 through 6.1.3.3 of AWS D1.5 are replaced with the following:

The QC Inspector shall be the duly designated person who acts for and on behalf of the Contractor for inspection, testing, and quality related matters for all welding.

Quality Assurance (QA) is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer.

The QC Inspector shall be responsible for quality control acceptance or rejection of materials and workmanship, and shall be currently certified as an AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors."

The QC Inspector may be assisted by an Assistant QC Inspector provided that this individual is currently certified as an AWS Certified Associate Welding Inspector (CAWI) in conformance with the requirements in AWS QC1, "Standard for AWS Certification of Welding Inspectors." The Assistant QC Inspector may perform inspection under the direct supervision of the QC Inspector provided the Assistant is always within visible and audible range of the QC Inspector. The QC Inspector shall be responsible for signing all reports and for determining if welded materials conform to workmanship and acceptance criteria. The ratio of QC Assistants to QC Inspectors shall not exceed 5 to 1.

When the term "Inspector" is used without further qualification, it shall refer to the QC Inspector.

Section 6.14.6, "Personnel Qualification," of AWS D1.1, Section 7.8, "Personnel Qualification," of AWS D1.4, and Section 6.1.3.4, "Personnel Qualification," of AWS D1.5 are replaced with the following:

Personnel performing nondestructive testing (NDT) shall be qualified and certified in conformance with the requirements of the American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A and the Written Practice of the NDT firm. The Written Practice of the NDT firm shall meet or exceed the guidelines of the ASNT Recommended Practice No. SNT-TC-1A. Individuals who perform NDT, review the results, and prepare the written reports shall be either:

- A. Certified NDT Level II technicians, or;
- B. Level III technicians who hold a current ASNT Level III certificate in that discipline and are authorized and certified to perform the work of Level II technicians.

Section 6.5.4 of AWS D1.5 is replaced with the following:

The QC Inspector shall inspect and approve each joint preparation, assembly practice, welding technique, joint fit-up, and the performance of each welder, welding operator, and tack welder to make certain that the applicable requirements of this code and the approved Welding Procedure Specification (WPS) are met. The QC Inspector shall examine the work to make certain that it meets the requirements of Sections 3 and 6.26. The size and contour of all welds shall be measured using suitable gages. Visual inspection for cracks in welds and base metal, and for other discontinuities should be aided by strong light magnifiers, or such other devices as may be helpful. Acceptance criteria different from those specified in this code may be used when approved by the Engineer.

Section 6.6.5, "Nonspecified NDT Other than Visual," of AWS D1.1, Section 6.6.5 of AWS D1.4 and Section 6.6.5 of AWS D1.5 shall not apply.

For any welding, the Engineer may direct the Contractor to perform NDT that is in addition to the visual inspection or NDT specified in the AWS or other specified welding codes, in the Standard Specifications, or in these special provisions. Additional NDT required by the Engineer will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. Should any welding deficiencies be discovered by this additional NDT, all costs associated with the repair of the deficient area, including NDT of the weld and of the weld repair, and any delays caused by the repair, shall be at the Contractor's expense.

Repair work to correct welding deficiencies discovered by visual inspection or NDT, or by additional NDT directed or performed by the Engineer, and any associated delays or expenses caused to the Contractor by performing these repairs, shall be at the Contractor's expense.

The Engineer shall have the authority to verify the qualifications or certifications of any welder, QC Inspector, or NDT personnel to specified levels by retests or other means approved by the Engineer.

Continuous inspection shall be provided when any welding is being performed. Continuous inspection, as a minimum, shall include having a QC Inspector within such close proximity of all welders or welding operators so that inspections by the QC Inspector of each welding operation at each welding location shall not lapse for a period exceeding 30 minutes.

Inspection and approval of all joint preparations, assembly practices, joint fit-ups, welding techniques, and the performance of each welder, welding operator, and tack welder shall be documented by the QC Inspector on a daily basis for each day welding is performed. For each inspection, including fit-up, Welding Procedure Specification (WPS) verification, and final weld inspection, the QC Inspector shall confirm and document compliance with the requirements of the AWS or other specified code criteria and the requirements of these special provisions on all welded joints before welding, during welding, and after the completion of each weld.

When joint weld details that are not prequalified to the details of Section 3 of AWS D1.1 or to the details of Figure 2.4 or 2.5 of AWS D1.5 are proposed for use in the work, the joint details, their intended locations, and the proposed welding parameters and essential variables, will be approved by the Engineer. The Engineer shall have 2 weeks to complete the review of the proposed joint detail locations. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. Upon approval of the proposed joint detail locations and qualification of the proposed joint details, welders and welding operators using these details shall perform a qualification test plate using the WPS variables and the joint detail to be used in production. The test plate shall have the maximum thickness to be used in production and a minimum length of 180 mm and minimum finish welded width 460 mm. The test plate shall be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria shall be as specified in the applicable AWS codes.

In addition to the requirements specified in the applicable code, the period of effectiveness for a welder's or welding operator's qualification shall be a maximum of 3 years for the same weld process, welding position, and weld type. If production welding will be performed without gas shielding, then qualification shall also be without gas shielding. Excluding welding of fracture critical members, a valid qualification at the beginning of work on a contract will be acceptable for the entire period of the contract, as long as the welder's or welding operator's work remains satisfactory.

The Engineer will witness all qualification tests for WPSs that were not previously approved by the Department. An approved independent third party will witness the qualification tests for welders or welding operators. The independent third party shall be a current CWI and shall not be employed by the contractor performing the welding. The Engineer shall have 2 weeks to review the qualifications and copy of the current certification of the independent third party. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for any resulting loss, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications. The Contractor shall notify the Engineer one week prior to performing any qualification tests. Witnessing of qualification tests by the Engineer shall not constitute approval of the intended joint locations, welding parameters, or essential variables.

In addition to the requirements of AWS D1.5 Section 5.12 or 5.13, welding procedures qualification, for work welded in conformance with that code, shall conform to the following requirements:

- A. Unless considered prequalified, fillet welds, including reinforcing fillet welds, shall be qualified in each position. The fillet weld soundness test shall be conducted using the essential variables of the WPS as established by the Procedure Qualification Record (PQR.)
- B. For qualification of joints that do not conform to Figures 2.4 and 2.5 of AWS D1.5, two WPS qualification tests are required. The tests conforming to AWS D1.5 Section 5.13 shall be conducted using both Figure 5.1 and Figure 5.3. The test conforming to Figure 5.3 shall be conducted using the same welding electrical parameters that were established for the test conducted conforming to Figure 5.1.

- C. The travel speed, current, and voltage values that are used for tests conducted per AWS D1.5 Section 5.12 or 5.13 shall be consistent for each weld joint, and shall in no case vary by more than 10 percent for travel speed, 10 percent for current, and 7 percent for voltage.
- D. For a WPS qualified in conformance with AWS D1.5 Section 5.13, the values to be used for calculating ranges for current and voltage shall be based on the average of all weld passes made in the test. Heat input shall be calculated using the average of current and voltage of all weld passes made in the test for a WPS qualified in conformance with Section 5.12 or 5.13.
- E. To qualify for unlimited material thickness, two qualification tests are required for WPSs utilized for welding material thicknesses greater than 38 mm. One test shall be conducted using 20-mm thick test plates, and one test shall be conducted using test plates with a thickness between 38 mm and 50 mm. Two maximum heat input tests may be conducted for unlimited thickness qualification.
- F. Macroetch tests are required for WPS qualification tests, and acceptance shall be per AWS D1.5 Section 5.19.3.
- G. When a weld joint is to be made using a combination of qualified WPSs, each process shall be qualified separately.
- H. When a weld joint is to be made using a combination of qualified and prequalified processes, the WPS shall reflect both processes and the limitations of essential variables, including weld bead placement, for both processes.
- I. Prior to preparing mechanical test specimens, the PQR welds shall be inspected by visual and radiographic tests. Backing bar shall be 75 mm in width and shall remain in place during NDT testing. Results of the visual and radiographic tests shall comply with AWS D1.5 Section 6.26.2, excluding Section 6.26.2.2. Test plates that do not comply with both tests shall not be used.

PAYMENT

Full compensation for conforming to the requirements of "Welding" shall be considered as included in the contract prices paid for the various items of work involved and no additional compensation will be allowed therefor.

SECTION 9. DESCRIPTION OF BRIDGE WORK

Bridge work shall consist of the construction of Retaining Wall No. 1 as shown in the plans.

SECTION 10. CONSTRUCTION DETAILS

SECTION 10-1. GENERAL

10-1.01 ORDER OF WORK

Order of work shall conform to the provisions in Section 5-1.05, "Order of Work," of the Standard Specifications and these special provisions.

Attention is directed to "Obstructions" elsewhere in these special provisions.

Attention is directed to "Material Containing Aerially Deposited Lead" elsewhere in these special provisions.

Temporary fence or temporary railing (Type K) shall be constructed prior to removal of any access control fences.

The Contractor shall, as a first order of work, make arrangement with the water companies or utility districts for necessary water meter/service installations.

Advance Information Signs as shown on the plans shall be placed at least (14) days before ramps are closed to public traffic. The signs shall show the dates and times of closure.

After completion of the concrete sidewalk adjacent to the new planting area and prior to all other work, all planting and irrigation work shall be installed.

Temporary railing (Type K) and temporary crash cushions shall be secured in place prior to commencing work for which the temporary railing and crash cushions are required.

Attention is directed to "Environmentally Sensitive Area" and "Temporary Fence (Type ESA)" of these special provisions. Prior to beginning work, the boundaries of the Environmentally Sensitive Areas (ESA) shall be clearly delineated in the field. The boundaries shall be delineated by the installation of temporary fence (Type ESA).

Attention is directed to "Water Pollution Control" of these special provisions regarding the submittal and approval of the "Water Pollution Control Program" prior to performing work having potential to cause water pollution.

The first order of work shall be to place the order for the traffic signal equipment. The Engineer shall be furnished a statement from the vendor that the order for the traffic signal equipment has been received and accepted by the vendor.

The uppermost layer of new pavement shall not be placed until all underlying conduits and loop detectors have been installed.

Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location.

No above ground electrical work shall be performed on any system within the project site until all the Contractor-furnished electrical materials for that individual system have been tested and delivered to the Contractor.

Attention is directed to "Maintaining Traffic" and "Temporary Pavement Delineation" of these special provisions and to the stage construction sheets of the plans.

Attention is directed to "Progress Schedule (Critical Path Method)" of these special provisions regarding the submittal of a general time-scaled logic diagram within 10 days after approval of the contract. The diagram shall be submitted prior to performing any work that may be affected by any proposed deviations to the construction staging of the project.

Before obliterating any pavement delineation (traffic stripes, pavement markings, and pavement markers) that is to be replaced on the same alignment and location, as determined by the Engineer, the pavement delineation shall be referenced by the Contractor, with a sufficient number of control points to reestablish the alignment and location of the new pavement delineation. The references shall include the limits or changes in striping pattern, including one- and 2-way barrier lines, limit lines, crosswalks and other pavement markings. Full compensation for referencing existing pavement delineation shall be considered as included in the contract prices paid for new pavement delineation and no additional compensation will be allowed therefor.

Prior to applying paint binder (tack coat), the Contractor shall cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured to the facility being covered by tape or adhesive. The covered facilities shall be referenced by the Contractor, with a sufficient number of control points to relocate the facilities after the paint binder (tack coat) has been placed. After completion of the paint binder (tack coat) operation, all covers shall be removed and disposed of in a manner satisfactory to the Engineer. Full compensation for covering manholes, valve and monument covers, grates, or other exposed facilities, referencing, and removing temporary cover shall be considered as included in the contract price paid per tonne for AC (Type A), and no additional compensation will be allowed therefor.

At those locations exposed to public traffic where guard railings are to be constructed, the Contractor shall schedule operations so that at the end of each working day there shall be no post holes open nor shall there be any railing posts installed without the blocks and rail elements assembled and mounted thereon.

Not less than 60 days prior to planting the plants, the Contractor shall furnish the Engineer a statement from the vendor that the order for the plants required for this contract, including inspection plants, has been received and accepted by the vendor. The statement from the vendor shall include the names, sizes, and quantities of plants ordered and the anticipated date of delivery.

The Contractor shall place orders for replacement plants with the vendor at the appropriate time so that the roots of the replacement plants are not in a root-bound condition.

Not less than 60 days prior to applying seeds, the Contractor shall furnish the Engineer a statement from the vendor that the order for the seed required for this contract has been received and accepted by the vendor. The statement from the vendor shall include the names and quantity of seed ordered and the anticipated date of delivery.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions, regarding restrictions for planting operations.

Unless otherwise shown on the plans or specified in these special provisions, conduits to be installed by the open trench method for water line crossovers and sprinkler control crossovers shall be installed prior to the installation of other pipe supply lines.

Attention is directed to Section 20-5.027B, "Wiring Plans and Diagrams," of the Standard Specifications regarding submittal of working drawings.

The Contractor shall complete all highway planting and irrigation work within the first 100 days of the contract. The plant establishment period shall be completed concurrently with other ongoing construction during the last 120 working days of the contract.

10-1.02 WATER POLLUTION CONTROL

Water pollution control work shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications and these special provisions.

This project lies within the boundaries of the Region 2 Regional Water Quality Control Board (RWQCB).

The State Water Resources Control Board (SWRCB) has issued a permit to the Department which governs storm water and non-storm water discharges from its properties, facilities and activities. The Department's Permit is entitled: "Order No. 99-06-DWQ, NPDES No. CAS000003, National Pollutant Discharge Elimination System (NPDES) Permit, Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation Properties, Facilities, and Activities." Copies of the Department's Permit are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254, and may also be obtained from the SWRCB Internet website at: <http://www.swrcb.ca.gov/stormwtr/caltrans.html>.

The Department's Permit references and incorporates by reference the current Statewide General Permit issued by the SWRCB entitled "Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit

No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Associated with Construction Activity," which regulates discharges of storm water and non-storm water from construction activities disturbing 0.4-hectare or more of soil in a common plan of development. Sampling and analysis requirements as specified in SWRCB Resolution No. 2001-46 are added to the Statewide General Permit. Copies of the Statewide General Permit and modifications thereto are available for review from the SWRCB, Storm Water Permit Unit, 1001 "I" Street, P.O. Box 1977, Sacramento, California 95812-1977, Telephone: (916) 341-5254 and may also be obtained from the SWRCB Internet website at: <http://www.swrcb.ca.gov/stormwtr/construction.html>.

The NPDES permits that regulate this project, as referenced above, are hereafter collectively referred to as the "Permits."

This project shall conform to the Permits and modifications thereto. The Contractor shall maintain copies of the Permits at the project site and shall make the Permits available during construction.

The Permits require the preparation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP shall be prepared in conformance with the requirements of the Permits, the Department's "Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual," and the Department's "Construction Site Best Management Practices (BMPs) Manual," including addenda to those permits and manuals issued up to and including the date of advertisement of the project. These manuals are hereinafter referred to, respectively, as the "Preparation Manual" and the "Construction Site BMPs Manual," and collectively, as the "Manuals." Copies of the Manuals may be obtained from the Department of Transportation, Material Operations Branch, Publication Distribution Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, Telephone: (916) 445-3520, and may also be obtained from the Department's Internet website at: <http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm>.

The Contractor shall know and fully comply with applicable provisions of the Permits and all modifications thereto, the Manuals, and Federal, State, and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from both the project site and areas of disturbance outside the project limits during construction. Attention is directed to Sections 7-1.01, "Laws to be Observed," and 7-1.12, "Indemnification and Insurance," of the Standard Specifications.

The Permits shall apply to storm water and certain permitted non-storm water discharges from areas outside the project site which are directly related to construction activities for this contract including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards and access roads. The Contractor shall comply with the Permits and the Manuals for those areas and shall implement, inspect and maintain the required water pollution control practices. The Engineer shall be allowed full access to these areas during construction to assure Contractor's proper implementation of water pollution control practices. Installing, inspecting and maintaining water pollution control practices on areas outside the highway right of way not specifically arranged and provided for by the Department for the execution of this contract, will not be paid for.

The Contractor shall be responsible for penalties assessed or levied on the Contractor or the Department as a result of the Contractor's failure to comply with the provisions in this section "Water Pollution Control" including, but not limited to, compliance with the applicable provisions of the Permits, the Manuals, and Federal, State and local regulations and requirements as set forth therein.

Penalties as used in this section, "Water Pollution Control," shall include fines, penalties and damages, whether proposed, assessed, or levied against the Department or the Contractor, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of the Permits, the Manuals, or applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

RETENTION OF FUNDS

Notwithstanding any other remedies authorized by law, the Department may retain money due the Contractor under the contract, in an amount determined by the Department, up to and including the entire amount of Penalties proposed, assessed, or levied as a result of the Contractor's violation of the Permits, the Manuals, or Federal or State law, regulations or requirements. Funds may be retained by the Department until final disposition has been made as to the Penalties. The Contractor shall remain liable for the full amount of Penalties until such time as they are finally resolved with the entity seeking the Penalties.

Retention of funds for failure to conform to the provisions in this section, "Water Pollution Control," shall be in addition to the other retention amounts required by the contract. The amounts retained for the Contractor's failure to conform to provisions in this section will be released for payment on the next monthly estimate for partial payment following the date when an approved SWPPP has been implemented and maintained, and when water pollution has been adequately controlled, as determined by the Engineer.

When a regulatory agency identifies a failure to comply with the Permits and modifications thereto, the Manuals, or other Federal, State or local requirements, the Department may retain money due the Contractor, subject to the following:

- A. The Department will give the Contractor 30 days notice of the Department's intention to retain funds from partial payments which may become due to the Contractor prior to acceptance of the contract. Retention of funds from payments made after acceptance of the contract may be made without prior notice to the Contractor.
- B. No retention of additional amounts out of partial payments will be made if the amount to be retained does not exceed the amount being withheld from partial payments pursuant to Section 9-1.06, "Partial Payments," of the Standard Specifications.
- C. If the Department has retained funds, and it is subsequently determined that the State is not subject to the entire amount of the Costs and Liabilities assessed or proposed in connection with the matter for which the retention was made, the Department shall be liable for interest on the amount retained for the period of the retention. The interest rate payable shall be 6 percent per annum.

During the first estimate period that the Contractor fails to conform to the provisions in this section, "Water Pollution Control," the Department may retain an amount equal to 25 percent of the estimated value of the contract work performed.

The Contractor shall notify the Engineer immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Department shall provide copies of correspondence, notices of violation, enforcement actions or proposed fines by regulatory agencies to the requesting regulatory agency.

STORM WATER POLLUTION PREVENTION PLAN PREPARATION, APPROVAL AND AMENDMENTS

As part of the water pollution control work, a Storm Water Pollution Prevention Plan (SWPPP) is required for this contract. The SWPPP shall conform to the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications, the requirements in the Manuals, the requirements of the Permits, and these special provisions. Upon the Engineer's approval of the SWPPP, the SWPPP shall be considered to fulfill the provisions in Section 7-1.01G, "Water Pollution," of the Standard Specifications for development and submittal of a Water Pollution Control Program.

No work having potential to cause water pollution, shall be performed until the SWPPP has been approved by the Engineer. Approval shall not constitute a finding that the SWPPP complies with applicable requirements of the Permits, the Manuals and applicable Federal, State and local laws, regulations, and requirements.

The Contractor shall designate a Water Pollution Control Manager. The Water Pollution Control Manager shall be responsible for the preparation of the SWPPP and required modifications or amendments, and shall be responsible for the implementation and adequate functioning of the various water pollution control practices employed. The Contractor may designate different Water Pollution Control Managers to prepare the SWPPP and to implement the water pollution control practices. The Water Pollution Control Managers shall serve as the primary contact for issues related to the SWPPP or its implementation. The Contractor shall submit to the Engineer a statement of qualifications, describing the training, previous work history and expertise of the individual selected by the Contractor to serve as Water Pollution Control Manager. The Water Pollution Control Manager shall have a minimum of 24 hours of formal storm water management training or certification as a Certified Professional in Erosion and Sediment Control (CPESC). The Engineer will reject the Contractor's submission of a Water Pollution Control Manager if the submitted qualifications are deemed to be inadequate.

The SWPPP shall apply to the areas within and those outside of the highway right of way that are directly related to construction operations including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, and access roads.

The SWPPP shall incorporate water pollution control practices in the following categories:

- A. Soil stabilization.
- B. Sediment control.
- C. Wind erosion control.
- D. Tracking control.
- E. Non-storm water management.
- F. Waste management and materials pollution control.

The following contract items of work shall be incorporated into the SWPPP as "Temporary Water Pollution Control Practices": Temporary Concrete Washout Facility, Temporary Construction Entrance, Temporary Cover, Temporary Drainage Inlet Protection, Temporary Silt Fence.

The Contractor's attention is directed to the special provisions provided for Temporary Water Pollution Control Practices.

The following contract items of work, as shown on the project plans or as specified elsewhere in these special provisions, shall be identified in the SWPPP as permanent water pollution control practices: Erosion Control (Netting), Erosion Control (Type D), Fiber Rolls, These permanent water pollution control practices shall be constructed as specified in "Order of Work" of these special provisions, and utilized during the construction period. The Contractor shall maintain and protect the

permanent water pollution control practices throughout the duration of the project and shall restore these controls to the lines, grades and condition shown on the plans prior to acceptance of the contract.

The SWPPP shall include, but not be limited to, the items described in the Manuals, Permits and related information contained in the contract documents. The SWPPP shall also include a copy of Notification of Construction.

The Contractor shall develop a Water Pollution Control Schedule that describes the timing of grading or other work activities that could affect water pollution. The Water Pollution Control Schedule shall be updated by the Contractor to reflect changes in the Contractor's operations that would affect the necessary implementation of water pollution control practices.

The Contractor shall complete the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual and shall incorporate water pollution control practices into the SWPPP. Water pollution control practices include the "Minimum Requirements" and other Contractor-selected water pollution control practices from the "Construction Site BMPs Consideration Checklist" and the "Project-Specific Minimum Requirements" identified in the Water Pollution Control Cost Break-Down of this section.

Within 20 working days after the approval of the contract, the Contractor shall submit 3 copies of the draft SWPPP to the Engineer. The Engineer will have 10 working days to review the SWPPP. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the SWPPP within 10 working days of receipt of the Engineer's comments. The Engineer will have 5 working days to review the revisions. Upon the Engineer's approval of the SWPPP, 4 approved copies of the SWPPP, incorporating the required changes, shall be submitted to the Engineer. In order to allow construction activities to proceed, the Engineer may conditionally approve the SWPPP while minor revisions are being completed. In the event the Engineer fails to complete the review within the time allowed, and if, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the review, the Contractor will be compensated for resulting losses, and an extension of time will be granted, in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

The Contractor shall prepare an amendment to the SWPPP when there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, municipal storm drain systems, or when the Contractor's activities or operations violate a condition of the Permits, or when directed by the Engineer. Amendments shall identify additional water pollution control practices or revised operations, including those areas or operations not identified in the initially approved SWPPP. Amendments to the SWPPP shall be prepared and submitted for review and approval within a time approved by the Engineer, but in no case longer than the time specified for the initial submittal and review of the SWPPP. At a minimum, the SWPPP shall be amended annually and submitted to the Engineer 25 days prior to the defined rainy season.

The Contractor shall keep one copy of the approved SWPPP and approved amendments at the project site. The SWPPP shall be made available upon request by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests by the public shall be directed to the Engineer.

COST BREAK-DOWN

The Contractor shall include a Water Pollution Control Cost Break-Down in the SWPPP which itemizes the contract lump sum for water pollution control work. The Contractor shall use the Water Pollution Control Cost Break-Down provided in this section as the basis for the cost break-down submitted with the SWPPP. The Contractor shall use the Water Pollution Control Cost Break-Down to identify items, quantities and values for water pollution control work, excluding Temporary Water Pollution Control Practices for which there are separate bid items. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted with the SWPPP. Partial payment for the item of water pollution control will not be made until the Water Pollution Control Cost Break-Down is approved by the Engineer.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Line items indicated in the Water Pollution Control Cost Break-Down in this section with a specified Estimated Quantity shall be considered "Project-Specific Minimum Requirements." The Contractor shall incorporate Project-Specific Minimum Requirements with Contractor-designated quantities and values into the Water Pollution Control Cost Break-Down submitted with the SWPPP.

Line items indicated in the Water Pollution Control Cost Break-Down in this section without a specified Estimated Quantity shall be considered by the Contractor for selection to meet the applicable "Minimum Requirements" as defined in the Manuals, or for other water pollution control work as identified in the "Construction Site BMPs Consideration Checklist" presented in the Preparation Manual. In the Water Pollution Control Cost Break-Down submitted with the SWPPP, the Contractor shall list only those water pollution control practices selected for the project, including quantities and values required to complete the work for those items.

The sum of the amounts for the items of work listed in the Water Pollution Control Cost Break-Down shall be equal to the contract lump sum price bid for water pollution control. Overhead and profit, except for time-related overhead, shall be included in the individual items listed in the cost break-down.

WATER POLLUTION CONTROL COST BREAK-DOWN**Contract No. 04-130524**

ITEM	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	VALUE	AMOUNT
SC-7	Street Sweeping and Vacuuming	LS	LS		
WE-1	Wind Erosion Control	LS	LS		
NS-1	Water Conservation Practices	LS	LS		
NS-3	Paving and Grinding Operation	LS	LS		
NS-8	Vehicle and Equipment Cleaning	LS	LS		
NS-9	Vehicle and Equipment Fueling	LS	LS		
NS-10	Vehicle and Equipment Maintenance	LS	LS		
WM-1	Material Delivery and Storage	LS	LS		
WM-2	Material Use	LS	LS		
WM-3	Stockpile Management	LS	LS		
WM-4	Spill Prevention and Control	LS	LS		
WM-5	Solid Waste Management	LS	LS		
WM-9	Sanitary/Septic Waste Management	LS	LS		

TOTAL _____

Adjustments in the items of work and quantities listed in the approved cost break-down shall be made when required to address amendments to the SWPPP, except when the adjusted items are paid for as extra work.

No adjustment in compensation will be made to the contract lump sum price paid for water pollution control due to differences between the quantities shown in the approved cost break-down and the quantities required to complete the work as shown on the approved SWPPP. No adjustment in compensation will be made for ordered changes to correct SWPPP work resulting from the Contractor's own operations or from the Contractor's negligence.

The approved cost break-down will be used to determine partial payments during the progress of the work and as the basis for calculating the adjustment in compensation for the item of water pollution control due to increases or decreases of quantities ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down item, the adjustment in compensation will be determined in the same manner specified for increases and decreases in the quantity of a contract item of work in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications. If an ordered change requires a new item which is not on the approved cost break-down, the adjustment in compensation will be determined in the same manner specified for extra work in conformance with Section 4-1.03D, "Extra Work," of the Standard Specifications.

If requested by the Contractor and approved by the Engineer, changes to the water pollution control practices listed in the approved cost break-down, including addition of new water pollution control practices, will be allowed. Changes shall be included in the approved amendment of the SWPPP. If the requested changes result in a net cost increase to the lump sum price for water pollution control, an adjustment in compensation will be made without change to the water pollution control item. The net cost increase to the water pollution control item will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

SWPPP IMPLEMENTATION

Unless otherwise specified, upon approval of the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, maintaining, removing, and disposing of the water pollution control practices specified in the SWPPP and in the amendments. Unless otherwise directed by the Engineer, the Contractor's responsibility for SWPPP implementation shall continue throughout temporary suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. Requirements for installation, construction, inspection, maintenance, removal, and disposal of water pollution control practices shall conform to the requirements in the Manuals and these special provisions.

If the Contractor or the Engineer identifies a deficiency in the implementation of the approved SWPPP or amendments, the deficiency shall be corrected immediately unless requested by the Contractor and approved by the Engineer in writing, but shall be corrected prior to the onset of precipitation. If the Contractor fails to correct the identified deficiency by the date agreed or prior to the onset of precipitation, the project shall be in nonconformance with this section, "Water Pollution Control." Attention is directed to Section 5-1.01, "Authority of Engineer," of the Standard Specifications, and to "Retention of Funds" of this section for possible nonconformance penalties.

If the Contractor fails to conform to the provisions of this section, "Water Pollution Control," the Engineer may order the suspension of construction operations until the project complies with the requirements of this section.

Implementation of water pollution control practices may vary by season. The Construction Site BMPs Manual and these special provisions shall be followed for control practice selection of year-round, rainy season and non-rainy season water pollution control practices.

Year-Round Implementation Requirements

The Contractor shall have a year-round program for implementing, inspecting and maintaining water pollution control practices for wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control.

The National Weather Service weather forecast shall be monitored and used by the Contractor on a daily basis. An alternative weather forecast proposed by the Contractor may be used if approved by the Engineer. If precipitation is predicted, the necessary water pollution control practices shall be deployed prior to the onset of the precipitation.

Disturbed soil areas shall be considered active whenever the soil disturbing activities have occurred, continue to occur or will occur during the ensuing 21 days. Non-active areas shall be protected as prescribed in the Construction Site BMPs Manual within 14 days of cessation of soil disturbing activities or prior to the onset of precipitation, whichever occurs first.

In order to provide effective erosion control, the Contractor may be directed by the Engineer to apply permanent erosion control in small or multiple units. The Contractor's attention is directed to "Erosion Control (Type D)" of these special provisions.

The Contractor shall implement, maintain and inspect the following temporary sediment control practices on a year-round basis. The listed practices shall remain in place until their use is no longer needed, as determined by the Engineer.

YEAR-ROUND SEDIMENT CONTROL PRACTICES	LOCATION USED
Temporary Cover	To be determined on location
Temporary Drainage Inlet Protection	As shown on plan
Temporary Silt Fence	EC-1 & EC-2 plan

Rainy Season Implementation Requirements

Soil stabilization and sediment control practices shall be provided throughout the rainy season, defined as between October 15 and April 15.

An implementation schedule of required soil stabilization and sediment control practices for disturbed soil areas shall be completed no later than 20 days prior to the beginning of each rainy season. The implementation schedule shall identify the soil stabilization and sediment control practices and the dates when the implementation will be 25 percent, 50 percent and 100 percent complete, respectively. For construction activities beginning during the rainy season, the Contractor shall implement applicable soil stabilization and sediment control practices. The Contractor shall implement soil stabilization and sediment control practices a minimum of 10 days prior to the start of the rainy season.

Throughout the defined rainy season, the active disturbed soil area of the project site shall be not more than hectares. The Engineer may approve, on a case-by-case basis, expansions of the active disturbed soil area limit. Soil stabilization and sediment control materials shall be maintained on site sufficient to protect disturbed soil areas. A detailed plan for the mobilization of sufficient labor and equipment shall be maintained to deploy the water pollution control practices required to protect disturbed soil areas prior to the onset of precipitation.

Non-Rainy Season Implementation Requirements

The non-rainy season shall be defined as days outside the defined rainy season. The Contractor's attention is directed to the Construction Site BMPs Manual for soil stabilization and sediment control implementation requirements on disturbed soil areas during the non-rainy season. Disturbed soil areas within the project shall be protected in conformance with the requirements in the Construction Site BMPs Manual with an effective combination of soil stabilization and sediment control.

MAINTENANCE

To ensure the proper implementation and functioning of water pollution control practices, the Contractor shall regularly inspect and maintain the construction site for the water pollution control practices identified in the SWPPP. The construction site shall be inspected by the Contractor as follows:

- A. Prior to a forecast storm.
- B. After a precipitation event which causes site runoff.
- C. At 24 hour intervals during extended precipitation events.
- D. Routinely, a minimum of once every two weeks outside of the defined rainy season.
- E. Routinely, a minimum of once every week during the defined rainy season.

The Contractor shall use the Storm Water Quality Construction Site Inspection Checklist provided in the CSWPPP or an alternative inspection checklist provided by the Engineer. One copy of each site inspection record shall be submitted to the Engineer within 24 hours of completing the inspection.

REPORTING REQUIREMENTS

Report of Discharges, Notices or Orders

If the Contractor identifies discharges into surface waters or drainage systems in a manner causing, or potentially causing, a condition of pollution, or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the Engineer. The Contractor shall submit a written report to the Engineer within 7 days of the discharge event, notice or order. The report shall include the following information:

- A. The date, time, location, nature of the operation, and type of discharge, including the cause or nature of the notice or order.
- B. The water pollution control practices deployed before the discharge event, or prior to receiving the notice or order.
- C. The date of deployment and type of water pollution control practices deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent reoccurrence.

- D. An implementation and maintenance schedule for affected water pollution control practices.

Report of First-Time Non-Storm Water Discharge

The Contractor shall notify the Engineer at least 3 days in advance of first-time non-storm water discharge events, excluding exempted discharges. The Contractor shall notify the Engineer of the operations causing non-storm water discharges and shall obtain field approval for first-time non-storm water discharges. Non-storm water discharges shall be monitored at first-time occurrences and routinely thereafter.

Annual Certifications

By June 15 of each year, the Contractor shall complete and submit an Annual Certification of Compliance, as contained in the Preparation Manual, to the Engineer.

SAMPLING AND ANALYTICAL REQUIREMENTS

The Contractor is required to implement specific sampling and analytical procedures to determine whether BMPs implemented on the construction site are:

- A. preventing pollutants that are known or should be known by permittees to occur on construction sites that are not visually detectable in storm water discharges, to cause or contribute to exceedances of water quality objectives.

Non-Visible Pollutants

The project has the potential to discharge non-visible pollutants in storm water from the construction site. The project SWPPP shall contain a Sampling and Analysis Plan (SAP) that describes the sampling and analysis strategy and schedule to be implemented on the project for monitoring non-visible pollutants in conformance with this section.

The SAP shall identify potential non-visible pollutants that are known or should be known to occur on the construction site associated with the following: (1) construction materials, wastes or operations; (2) known existing contamination due to historical site usage; or (3) application of soil amendments, including soil stabilization products, with the potential to alter pH or contribute toxic pollutants to storm water. Planned material and waste storage areas, locations of known existing contamination, and areas planned for application of soil amendments shall be shown on the SWPPP Water Pollution Control Drawings.

The SAP shall identify a sampling schedule for collecting a sample down gradient from the applicable non-visible pollutant source and a sufficiently large uncontaminated control sample during the first two hours of discharge from rain events during daylight hours which result in a sufficient discharge for sample collection. If run-on occurs onto the non-visible pollutant source, a run-on sample that is immediately down gradient of the run-on to the Department's right of way shall be collected. A minimum of 72 hours of dry weather shall occur between rain events to distinguish separate rain events.

The SAP shall state that water quality sampling will be triggered when any of the following conditions are observed during the required storm water inspections conducted before or during a rain event:

- A. Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions.
- B. Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.
- C. Construction activities, such as application of fertilizer, pesticide, herbicide, methyl methacrylate concrete sealant, or non-pigmented curing compound have occurred during a rain event or within 24 hours preceding a rain event, and there is the potential for discharge of pollutants to surface waters or drainage system.
- D. Soil amendments, including soil stabilization products, with the potential to alter pH levels or contribute toxic pollutants to storm water runoff have been applied, and there is the potential for discharge of pollutants to surface waters or drainage system (unless independent test data are available that demonstrate acceptable concentration levels of non-visible pollutants in the soil amendment).
- E. Storm water runoff from an area contaminated by historical usage of the site is observed to combine with storm water, and there is the potential for discharge of pollutants to surface waters or drainage system.

The SAP shall identify sampling locations for collecting down gradient and control samples, and the rationale for their selection. The control sampling location shall be selected where the sample does not come into contact with materials, wastes or areas associated with potential non-visible pollutants or disturbed soil areas. Sampling locations shall be shown on the SWPPP Water Pollution Control Drawings. Only trained personnel shall collect water quality samples and be identified in the SAP. Qualifications of designated sampling personnel shall describe training and experience, and shall be included in

the SWPPP. The SAP shall state monitoring preparation, sample collection procedures, quality assurance/quality control, sample labeling procedures, sample collection documentation, sample shipping and chain of custody procedures, sample numbering system, and reference the construction site health and safety plan.

The SAP shall identify the analytical method to be used for analyzing down gradient and control samples for potential non-visible pollutants on the project. For samples analyzed in the field by sampling personnel, collection, analysis, and equipment calibration shall be in conformance with the Manufacturer's specifications. For samples that will be analyzed by a laboratory, sampling, preservation, and analysis shall be performed by a State-certified laboratory in conformance with 40 CFR 136. The SAP shall identify the specific State-certified laboratory, sample containers, preservation requirements, holding times, and analysis method to be used. A list of State-certified laboratories that are approved by the Department is available at the following internet site: http://www.dhs.ca.gov/ps/ls/elap/html/lablist_county.htm.

Analytical Results and Evaluation

The Contractor shall submit a hard copy and electronic copy of water quality analytical results and quality assurance/quality control data to the Engineer within 5 days of sampling for field analyses and within 30 days for laboratory analyses. Analytical results shall be accompanied by an evaluation from the Contractor to determine if down gradient samples show elevated levels of the tested parameter relative to levels in the control sample. If down gradient or downstream samples, as applicable, show increased levels, the Contractor will assess the BMPs, site conditions, and surrounding influences to determine the probable cause for the increase. As determined by the assessment, the Contractor will repair or modify BMPs to address increases and amend the SWPPP as necessary. Electronic results (in one of the following file formats: .xls, .txt, .csv, .dbs, or .mdb) shall have at a minimum the following information: sample identification number, contract number, constituent, reported value, method reference, method detection limit, and reported detection limit. The Contractor shall document sample collection during rain events.

Water quality sampling documentation and analytical results shall be maintained with the SWPPP on the project site until a Notice of Completion has been submitted and approved.

If construction activities or knowledge of site conditions change, such that discharges or sampling locations change, the Contractor shall amend the SAP in conformance with this section, "Water Pollution Control."

PAYMENT

The contract lump sum price paid for prepare storm water pollution prevention plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in developing, preparing, obtaining approval of, revising, and amending the SWPPP, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Attention is directed to Section 9-1.06, "Partial Payments," and Section 9-1.07, "Payment After Acceptance," of the Standard Specifications. Payments for prepare storm water pollution prevention plan will be made as follows:

- A. After the SWPPP has been approved by the Engineer, 75 percent of the contract item price for prepare storm water pollution prevention plan will be included in the monthly partial payment estimate.
- B. After acceptance of the contract in conformance with the provisions in Section 7-1.17, "Acceptance of Contract," of the Standard Specifications, payment for the remaining 25 percent of the contract item price for prepare storm water pollution prevention plan will be made in conformance with the provisions in Section 9-1.07.

The contract lump sum price paid for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing, constructing, removing, and disposing of water pollution control practices, including non-storm water management, and waste management and materials pollution water pollution control practices, except those for which there is a contract item of work as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Storm water sampling and analysis will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications. No payment will be made for the preparation, collection, analysis, and reporting of storm water samples required where appropriate BMPs are not implemented prior to a rain event, or if a failure of a BMP is not corrected prior to a rain event.

For items identified on the approved Water Pollution Control Cost Break-Down, the cost of maintaining the temporary water pollution control practices shall be divided equally by the State and the Contractor as follows:

Soil Stabilization

Temporary water pollution control practices except:

SS-1 Scheduling

SS-2 Preservation of Existing Vegetation

Sediment Control

Temporary water pollution control practices except:
SC-7 Street Sweeping and Vacuuming

Wind Erosion Control

No sharing of maintenance costs will be allowed.

Tracking Control

TC-1 Stabilized Construction Entrance/Exit.

Non-Storm Water Management

No sharing of maintenance costs will be allowed.

Waste Management & Materials Pollution Control

No sharing of maintenance costs will be allowed.

The division of cost will be made by determining the cost of maintaining water pollution control practices in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost. Cleanup, repair, removal, disposal, improper installation, and replacement of water pollution control practices damaged by the Contractor's negligence, shall not be considered as included in the cost for performing maintenance.

The provisions for sharing maintenance costs shall not relieve the Contractor from the responsibility for providing appropriate maintenance on items with no shared maintenance costs.

Full compensation for non-shared maintenance costs of water pollution control practices, as specified in this section, "Water Pollution Control," shall be considered as included in the contract lump sum price paid for water pollution control and no additional compensation will be allowed therefor.

Water pollution control practices for which there is a contract item of work, will be measured and paid for as that contract item of work.

10-1.03 TEMPORARY SOIL STABILIZER

Temporary soil stabilizer shall be applied at the locations shown on the plans and in conformance with these special provisions.

Temporary soil stabilizer shall consist of applying soil stabilizer to embankment slopes, excavation slopes and other areas shown on the plans.

Preparation shall conform to the provisions in Section 20-3.02, "Preparation," of the Standard Specifications.

Attention is directed to "Water Pollution Control" of these special provisions.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and the following requirements for soil stabilizers:

Emulsion Material

- A. Emulsion material shall consist of a non-ionic pitch and rosin emulsion with a minimum total solids content of 50 percent. The rosin content shall be a minimum of 26 percent and a maximum of 36 percent of the total solids content. Emulsion material shall be formulated with a non-ionic emulsifying agent and shall have a minimum shelf life of one year.
- B. Emulsion material shall be formulated specifically for use in erosion control and soil stabilization. Emulsion material shall be non-corrosive and shall be a water-soluble emulsion that, upon application, cures to a water insoluble binding and cementing agent.

APPLICATION

Temporary soil stabilizers shall be applied in conformance with Appendix C, CD26A(2) in the Construction Contractors Guide and Specifications of the Caltrans Storm Water Quality Handbooks and as follows:

- A. The application rate for temporary soil stabilizer shall be 30 kg of solid per hectare of surface covered.

- B. Stabilizers miscible in water shall be mixed with additional water at the rate specified by the manufacturer.
- C. Stabilizers shall not be applied during rain or applied to areas with standing water.

MEASUREMENT AND PAYMENT

Temporary soil stabilizer will be measured and paid for by the kilogram or tonne in the same manner specified for stabilizing emulsion in Section 20-3.06, "Measurement," and Section 20-3.07, "Payment," of the Standard Specifications.

Temporary soil stabilizer placed at locations other than as shown on the project plans or directed by the Engineer, in conformance with the Contractor's Storm Water Pollution Prevention Plan will not be measured and will be paid for as specified in "Water Pollution Control" of these special provisions.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary soil stabilizer required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary soil stabilizer.

10-1.04 TEMPORARY COVER

Temporary cover shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Attention is directed to "Water Pollution Control" of these special provisions.

Temporary cover shall be one of the water pollution control practices for soil stabilization. The Storm Water Pollution Prevention Plan include the use of temporary cover.

MATERIALS

Temporary Cover Fabric

Temporary cover fabric shall be either a geomembrane (plastic sheeting) or a geotextile (engineering fabric) conforming to one of the following requirements:

- A. Geotextile shall be a woven, slit film fabric which is also known as woven tape. The fabric shall be non-biodegradable, resistant to deterioration by sunlight, and inert to most soil chemicals. Edges of the film fabric shall be selvedge or serge to prevent unraveling. The film fabric shall also conform to the following requirements:

Specification	Requirements
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	15
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	13.3
Permittivity, 1/sec, max. (liters per minute per square meter) ASTM Designation: D 4491	0.08 (244)
Ultraviolet light stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon arc lamp method)	70

* or appropriate test method for specific polymer

- B. Geomembrane shall consist of 0.25-mm thick, single-ply material in conformance with the requirements in ASTM Designation: D 5199.

Temporary cover fabric shall be manufactured from polyethylene or polypropylene, or comparable polymers. The polymer materials may be virgin, recycled, or a combination of virgin and recycled materials. The polymer materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance with the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Restrainers

Restrainers for securing the temporary cover fabric on slopes and stockpiles shall consist of one or a combination of the following:

- A. Gravel-filled bags used as restrainers shall be knotted, roped, and placed at a maximum of 2 m apart on the temporary cover fabric as shown on the plans. Gravel-filled bags shall be between 13 kg and 22 kg in mass, between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width. Gravel bag fabric shall be non-woven polypropylene geotextile with a minimum unit weight of 270 g/m². The fabric shall have a minimum grab tensile strength (25-mm grip) of 0.89-kN in conformance with the requirements in ASTM Designation: D 4632, and an ultraviolet (UV) stability of 70 percent tensile strength retained after 500 hours in conformance to the requirements in ASTM Designation: D 4355, xenon arc lamp method. Gravel shall consist of non-cohesive material between 10 mm and 20 mm in diameter, free of clay balls, organic matter, and other deleterious material. The openings of filled gravel bags shall be secured to prevent escape of gravel.
- B. Restrainers consisting of a steel anchor with a wooden lath shall be fabricated and placed as shown on the plans. Wooden lath shall conform to the provisions in Section 20-2.12, "Lumber," of the Standard Specifications and shall be fir or pine, 38 mm x 89 mm in size, and 2.4 m in length. The wooden lath shall be secured to the temporary cover with steel anchors placed 1.2 m apart along the lath.

The Contractor may use an alternative restrainer if approved by the Engineer in writing. The Contractor shall submit details for an alternative restrainer to the Engineer prior to installation. The alternative restrainer shall be installed and maintained in conformance with these special provisions.

INSTALLATION

Temporary cover shall be installed as follows:

- A. Temporary cover fabric shall be placed and anchored as shown on the plans.
- B. Abutting edges of the temporary cover fabric shall overlap a minimum of 600 mm. Non-abutting edges shall be embedded in the soil a minimum of 150 mm.
- C. Restrainers shall be placed at the overlap area and along the toe of the slope. Restrainers outside the overlap areas shall be placed at a maximum spacing of 2.4 m.
- D. Steel anchors shall be installed to allow the leg of the steel anchor to pierce through the temporary cover fabric into the slope with the crown section securing the wooden lath firmly against the slope.
- E. Earthen berm, a linear sediment barrier, shall be constructed adjacent to the toe of the slope with a minimum height of 200 mm and a minimum width of 940 mm. The earthen berms shall be hand or mechanically compacted. Alternative linear sediment barrier may be used at the Contractor's expense if approved by the Engineer in writing.

If the Contractor removes the temporary cover in order to facilitate other work, the temporary cover shall be replaced and secured by the Contractor at the Contractor's expense.

When no longer required as determined by the Engineer, temporary cover shall become the property of the Contractor and be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbances, including holes and depressions, caused by the installation and removal of the temporary cover shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

The Contractor shall maintain the temporary cover throughout the contract to prevent displacement or migration of the material on the slope or stockpiled.

Temporary cover shall be maintained to minimize exposure of the protected area. Restrainers shall be relocated and secured as needed to restrain the temporary cover fabric in place. Temporary cover that breaks free shall be immediately secured. Holes, tears, and voids in the temporary cover fabric shall be patched, repaired, or replaced. When patches or repairs are unacceptable as determined by the Engineer, the temporary cover shall be replaced.

Temporary cover shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary cover resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of temporary cover to be paid for will be measured by the square meter for the actual area covered.

The contract price paid per square meter for temporary cover shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary cover, complete in place, including trench excavation and backfill, maintenance, and removal of temporary cover, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary cover required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary cover.

10-1.05 TEMPORARY CONCRETE WASHOUT FACILITY

Temporary concrete washout facilities shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Attention is directed to "Water Pollution Control" of these special provisions.

Temporary concrete washout facilities shall be one of the water pollution control practices for waste management and materials pollution control. The Storm Water Pollution Prevention Plan shall include the use of temporary concrete washout facilities.

MATERIALS

Plastic Liner

Plastic liner shall be single ply, new polyethylene sheeting, a minimum of 0.25-mm thick and shall be free of holes, punctures, tears or other defects that compromise the impermeability of the material. Plastic liner shall not have seams or overlapping joints.

Gravel-filled Bags

Gravel bag fabric shall be non-woven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials.

The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Straw Bales

Straw for straw bales shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications.

Straw bales shall be a minimum of 360 mm in width, 450 mm in height, 900 mm in length and shall have a minimum mass of 23 kg. The straw bale shall be composed entirely of vegetative matter, except for binding material.

Straw bales shall be bound by either wire, nylon or polypropylene string. Jute or cotton binding shall not be used. Baling wire shall be a minimum 1.57 mm in diameter. Nylon or polypropylene string shall be approximately 2 mm in diameter with 360 N of breaking strength.

Stakes

Stakes shall be wood or metal. Wood stakes shall be untreated fir, redwood, cedar, or pine, shall be cut from sound timber, and shall be straight and free from loose or unsound knots and other defects which would render them unfit for the purpose intended. Wood stakes shall be minimum 50 mm x 50 mm in size. Metal stakes may be used as an alternative, and shall be a minimum 13 mm in diameter. Stakes shall be a minimum 1.2 m in length. The tops of the metal stakes shall be bent at a 90-degree angle or capped with an orange or red plastic safety cap that fits snugly to the metal stake. The Contractor shall submit a sample of the metal stake and plastic cap, if used, for Engineer's approval prior to installation.

Staples

Staples shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for Engineer's approval prior to installation.

Signs

Wood posts for signs shall conform to the provisions in Section 56-2.02B, "Wood Posts," of the Standard Specifications. Lag screws shall conform to the provisions in Section 56-2.02D, "Sign Panel Fastening Hardware," of the Standard Specifications.

Plywood shall be freshly painted for each installation with not less than 2 applications of flat white paint. Sign letters shown on the plans shall be stenciled with commercial quality exterior black paint. Testing of paint will not be required.

INSTALLATION

Temporary concrete washout facilities shall be as follows:

- A. Temporary concrete washout facilities shall be installed prior to beginning placement of concrete and located a minimum of 15 m from storm drain inlets, open drainage facilities, and water courses unless determined infeasible by the Engineer. Temporary concrete washout facilities shall be located away from construction traffic or access areas at a location determined by the Contractor and approved by the Engineer.
- B. A sign shall be installed adjacent to each washout facility at a location determined by the Contractor and approved by the Engineer. Signs shall be installed in conformance with the provisions in Section 56-2.03, "Construction," and Section 56-2.04, "Sign Panel Installation," of the Standard Specifications.
- C. The length and width of a temporary concrete washout facility may be increased from the minimum dimensions shown on the plans, at the Contractor's expense and upon approval of the Engineer.
- D. Temporary concrete washout facilities shall be constructed in sufficient quantity and size to contain liquid and concrete waste generated by washout operations for concrete wastes. These facilities shall be constructed to contain liquid and concrete waste without seepage, spillage or overflow.
- E. Berms for below grade temporary concrete washout facilities shall be constructed from compacted native material. Gravel may be used in conjunction with compacted native material.
- F. Plastic liner shall be installed in below grade temporary concrete washout facilities.

Details for an alternative temporary concrete washout facility shall be submitted to the Engineer for approval at least 7 days prior to installation.

When temporary concrete washout facilities are no longer required for the work, as determined by the Engineer, the hardened concrete and liquid residue shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Temporary concrete washout facilities shall become the property of the Contractor and be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 300 mm. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications. Holes, rips, and voids in the plastic liner shall be patched and repaired by taping or the plastic liner shall be replaced. Plastic liner shall be replaced when patches or repairs compromise the impermeability of the material as determined by the Engineer.

Gravel bags shall be replaced when the bag material is ruptured or when the yarn has failed, allowing the bag contents to spill out.

Temporary concrete washout facility shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary concrete washout facility resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of temporary concrete washout facility to be paid for will be measured as unit determined from actual count in place.

The contract unit price paid for temporary concrete washout facility shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in constructing temporary concrete washout facility, complete in place, including excavation and backfill, maintenance, and removal of temporary concrete washout facility, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary concrete washout facility required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary concrete washout facility.

10-1.06 TEMPORARY SILT FENCE

Temporary silt fence shall be furnished, installed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Attention is directed to "Water Pollution Control" of these special provisions.

Temporary silt fence shall be one of the water pollution control practices for sediment control. The Storm Water Pollution Prevention Plan shall include the use of temporary silt fence.

MATERIALS

At the Contractor's option, temporary silt fence shall be prefabricated or constructed with silt fence fabric, posts, and fasteners.

Silt Fence Fabric

Silt fence fabric shall be geotextile manufactured from woven polypropylene or polymer material. Silt Fence Fabric may be virgin or recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled polymer materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Silt fence fabric shall conform to the following requirements:

Specification	Requirements
Width, mm, min.	900
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632*	0.55
Elongation, percent minimum in each direction ASTM Designation: D 4632*	15
Permittivity, 1/sec., min. ASTM Designation: D 4491	0.05
Flow rate, liters per minute per square meter, min. ASTM Designation: D 4491	400
Ultraviolet stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	70

* or appropriate test method for specific polymer

Posts

Posts for temporary silt fence shall be one of the following:

- A. Posts shall be untreated fir or pine, minimum 34 mm x 40 mm in size, and 1.2 m in length. One end of the post shall be pointed.
- B. Posts shall be steel and have a "U", "T", "L" or other cross sectional shape that can resist failure by lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post prior to installation.

Fasteners

Fasteners for attaching silt fence fabric to posts shall be as follows:

- A. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.
- B. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

INSTALLATION

Temporary silt fence shall be installed parallel with the slope contour in reaches not to exceed 150 m. A reach is considered a continuous run of temporary silt fence from end to end or from an end to an opening, including joined panels. Each reach shall be constructed so that the elevation at the base of the fence does not deviate from the contour more than one third of the fence height.

The silt fence fabric shall be installed on the side of the posts facing the slope. The silt fence fabric shall be anchored in a trench as shown on the plans. The trench shall be backfilled and mechanically or hand tamped to secure the silt fence fabric in the bottom of the trench.

Mechanically pushing 300 mm of the silt fence fabric vertically through the soil may be allowed if the Contractor can demonstrate to the Engineer that the silt fence fabric will not be damaged and will not slip out of the soil, resulting in sediment passing under the silt fence fabric.

At the option of the Contractor, the maximum post spacing may increase to 3 m if the fence is reinforced by a wire or plastic material by prefabrication or by field installation. The field-assembled reinforced temporary silt fence shall be able to retain saturated sediment without collapsing.

Temporary silt fence shall be joined as shown on the plans. The tops of the posts shall be tied together by minimum of 2 wraps of tie wire of a minimum 1.5 mm diameter. The silt fence fabric shall be attached to the posts at the joint as specified in these special provisions.

Temporary silt fence shall be repaired or replaced at the expense of the Contractor on the same day when the damage occurs.

When no longer required as determined by the Engineer, temporary silt fence shall become the property of the Contractor and be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Trimming the silt fence fabric and leaving it in place will not be allowed.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary silt fence shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately one-third the height of the silt fence fabric above ground. When sediment exceeds this height, or when directed by the Engineer, sediment shall be removed. The removed sediment shall be deposited within the project limits in such a way that the sediment is not subject to erosion by wind or by water.

Temporary silt fence shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary silt fence resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of temporary silt fence to be paid for will be measured by the meter, parallel with the ground slope along the line of the installed temporary silt fence, deducting the widths of openings.

The contract price paid per meter for temporary silt fence shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary silt fence, complete in place, including trench excavation and backfill, maintenance, and removal of temporary silt fence, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary silt fence required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary silt fence.

10-1.07 PRESERVATION OF PROPERTY

Attention is directed to Section 7-1.11, "Preservation of Property," 7-1.12, "Responsibility for Damage," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

Existing trees, shrubs and other plants, that are not to be removed as shown on the plans or specified in these special provisions, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be 600 mm box and the minimum size of shrub replacement shall be No. 15 container. Replacement ground cover plants shall be from flats and shall be planted 300 mm on center. Replacement of Carpobrotus ground cover plants shall be from cuttings and shall be planted 300 mm on center. Replacement planting shall conform to the requirements in Section 20-4.07, "Replacement," of the Standard Specifications. The Contractor shall water replacement plants in conformance with the provisions in Section 20-4.06, "Watering," of the Standard Specifications.

Damaged or injured plants shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications. At the option of the Contractor, removed trees and shrubs may be reduced to chips. The chipped material shall be spread within the highway right of way at locations designated by the Engineer.

Replacement planting of injured or damaged trees, shrubs, and other plants shall be completed prior to the start of the plant establishment period. Replacement planting shall conform to the provisions in Section 20-4.05, "Planting," of the Standard Specifications.

Operations shall be conducted in such a manner that existing facilities, surfacing, installations, and utilities which are to remain in place will not be damaged. Temporary surfacing, facilities, utilities and installations shall also be protected until they are no longer required. The Contractor, at his expense shall furnish and install piling, sheet piling, cribbing, bulkheads, shores, or whatever means may be necessary to adequately support material carrying such facilities, or to support the facilities themselves and shall maintain such support until they are no longer needed.

10-1.08 TEMPORARY HYDRAULIC MULCH (BONDED FIBER MATRIX)

Temporary hydraulic mulch (bonded fiber matrix) shall be furnished, applied, and maintained at locations as shown on the plans, as specified in these special provisions and as directed by the Engineer.

Temporary hydraulic mulch (bonded fiber matrix) shall consist of applying a bonded fiber matrix soil stabilizer to active and non-active disturbed areas.

Attention is directed to "Water Pollution Control" of these special provisions.

Temporary hydraulic mulch (bonded fiber matrix) shall be used as one of the water pollution control practices for soil stabilization. The Storm Water Pollution Prevention Plan shall include the use of temporary hydraulic mulch (bonded fiber matrix).

Erosion control (Type BFM) materials shall not be applied if rain is expected within 24 hours and shall not be applied to saturated soils. Wet surfaces, caused by sub-surface seeps and drainages shall be remedied prior to application.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and the following requirements:

Emulsion Material (Solids)

Emulsion material (solids) shall conform to the following:

- A. Emulsion material (solids) shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions. Emulsion material (solids) shall be nonflammable, non-toxic to plants and animals, shall have no growth or germination inhibiting factors, and shall have an effective life of at least one year.
- B. Emulsion material (solids) shall be an organic bonding tackifier of high viscosity colloidal polysaccharide with activating agents, or a blended hydrocolloid-based binder. The emulsion material (solids) shall not dissolve or disperse upon rewetting. The emulsion material (solids) shall be bonded to the fiber or prepackaged with the fiber by the manufacturer. The emulsion material (solids), including activating agents and additives, shall be 10 percent by weight, minimum, of the fiber.

Fiber

- A. Fiber shall conform to the provisions in Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Fiber shall be long strand, virgin wood fibers, thermo-mechanically defibrated from clean whole wood chips, containing a minimum of 25% of the fibers averaging 10 mm long, with a minimum of 50% or more retained

on a #24 mesh screen. The wood chips shall be processed in such manner to contain no lead paint, printing ink, varnish, petroleum products, or seed germination inhibitors. Fiber shall not be produced from recycled material such as sawdust, paper, cardboard, or chlorine bleached paper mill residue. A coloring agent shall be included and shall be biodegradable and non-toxic.

APPLICATION

Temporary hydraulic mulch (bonded fiber matrix) shall be applied in conformance with the Construction Site Best Management Practices Manual of the Caltrans Storm Water Quality Handbooks and as follows:

- A. Temporary hydraulic mulch (bonded fiber matrix) shall be applied to active and non-active areas where the soil is moist to a minimum depth of 10 mm. Prior to applying temporary hydraulic mulch (bonded fiber matrix), water shall be applied to areas that lack sufficient soil moisture. Water shall be applied with hydro-seeding equipment, in a uniform manner using the proper nozzle to disperse the flow such that the soil surface is wetted to a minimum depth of 10 mm. Water application shall not generate excessive runoff or create erosion.
- B. The following mixture in the proportions indicated shall be applied with hydroseeding equipment. Successive applications shall be used to achieve the indicated rate:

Material	Kilograms Per Hectare (Slope measurement)
Bonded Fiber*	4000.00

*Includes fiber and emulsion material (solids).

- C. The dilution of bonded fiber (kilograms) to water (liter) per hectare shall be as required to facilitate even application of material.
- D. Materials shall be applied shall to form a continuous mat covering 100% of the soil surface, shall have a minimum thickness of 3 mm, and shall have no gaps between the mat and the soil surface.
- E. Materials shall be applied from two or more directions to avoid shadowing effects and achieve a continuous mat.
- F. Materials shall be applied in successive layers to avoid slumping and aid drying.
- G. Materials shall be applied during dry weather and with a minimum of 24-hours of dry weather predicted between completion of materials application and rain.

MAINTENANCE

Temporary hydraulic mulch (bonded fiber matrix) shall be reapplied on the same day the damage occurs. Temporary hydraulic mulch (bonded fiber matrix) shall be reapplied when the area treated with temporary hydraulic mulch (bonded fiber matrix) becomes exposed or exhibits visible erosion.

Temporary hydraulic mulch (bonded fiber matrix) disturbed or displaced during the progress of work or resulting from the Contractor's vehicles, equipment, or operations shall be reapplied at the expense of the Contractor.

MEASUREMENT AND PAYMENT

The quantity of temporary hydraulic mulch (bonded fiber matrix) will be measured by the square meter as determined from actual slope measurements of the areas covered by the temporary hydraulic mulch (bonded fiber matrix).

Temporary hydraulic mulch (bonded fiber matrix) will be measured and paid for when placed in conformance with the Contractor's approved Water Pollution Control Program.

The contract price paid per square meter for temporary hydraulic mulch (bonded fiber matrix) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing temporary hydraulic mulch (bonded fiber matrix), complete in place, including applying water, furnishing and applying bonded fiber matrix as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.09 TEMPORARY DRAINAGE INLET PROTECTION

Temporary drainage inlet protection shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Attention is directed to "Water Pollution Control" of these special provisions.

Temporary drainage inlet protection shall be one of the water pollution control practices for sediment control. The Storm Water Pollution Prevention Plan shall include the use of temporary drainage inlet protection.

Temporary drainage inlet protection shall be either Type 1, Type 2, Type 3A, Type 3B, Type 4B or Type 5.

Special attention shall be given to existing and new drainage inlets adjacent to traffic. The Engineer shall review the need for drainage inlet protection at each location. Each proposed drainage inlet protection shall be approved by the Engineer to ensure safety.

MATERIALS

Erosion Control Blanket

Erosion control blanket for temporary drainage inlet protection (Types 1, 2, and 3B) shall be one of the following:

- A. Machine produced mats consisting of curled wood excelsior with 80 percent of the fiber 150 mm or longer. The excelsior blanket shall be of consistent thickness with wood fiber evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with an extruded photodegradable plastic netting or lightweight non-synthetic netting. The blanket shall be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Excelsior blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.40-kg/m^2 .
- B. Machine produced mats consisting of 70 percent straw and 30 percent coconut fiber with an extruded photodegradable plastic netting or lightweight non-synthetic netting on the top and bottom surfaces of the blanket. The straw and coconut shall adhere to the netting using thread or glue strip. The straw and coconut blanket shall be of consistent thickness, with straw and coconut fiber shall be evenly distributed over the entire area of the blanket. Straw and coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27 kg/m^2 .
- C. Machine produced mats consisting of 100 percent coir consisting of coconut fiber with an extruded photodegradable plastic netting or lightweight non-synthetic netting on the top and bottom surfaces of the blanket. The coconut fiber shall adhere to the netting using thread or glue strip. The coconut blanket shall be of consistent thickness, with coconut fiber evenly distributed over the entire area of the blanket. Coconut fiber blanket shall be furnished in rolled strips with a minimum mass per unit area of 0.27 kg/m^2 .
- D. Machine woven netting consisting of 100 percent spun coir consisting of coconut fiber with an average open area of 63 to 70 percent. Coconut coir netting shall be furnished in rolled strips with a minimum mass per unit area of 0.40 kg/m^2 .

Geotextile

Geotextile blanket for temporary drainage inlet protection (Types 1, 2, and 3B) shall conform to the provisions in Section 88-1.04, "Rock Slope Protection Fabric," of the Standard Specifications for rock slope protection fabric (Type A).

Staples

Staples for temporary drainage inlet protection (Types 1, 2, and 3B) shall be as shown on the plans. An alternative attachment device such as geotextile pins or plastic pegs may be used instead of staples. The Contractor shall submit a sample of the alternative attachment device for Engineer's approval prior to installation.

Rocks

Rocks for temporary drainage inlet protection (Types 1 and 2) shall be angular to subangular in shape, and shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

Square Screen Size (mm)	Percentage Passing
150	100
75	0-20

Stakes

Stakes (fiber roll) shall have a minimum section of 19 mm x 38 mm and sufficient length as shown on detail. Stakes shall be driven to a maximum of 50 mm above, or flush with, the top of the roll. Wood stakes shall be untreated fir, redwood, cedar, or pine, shall be cut from sound timber, and shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended.

Rope

Rope (fiber roll) shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

Gravel-filled Bags

Gravel bag fabric for temporary drainage inlet protection (Types 3A, 3B, and 4B) shall be non-woven polypropylene geotextile (or comparable polymer) and shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	270
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Ultraviolet stability, percent tensile strength retained after 500 hours, ASTM Designation: D4355, xenon arc lamp method	70

* or appropriate test method for specific polymer

Gravel bags shall be between 600 mm and 800 mm in length, and between 400 mm and 500 mm in width.

Yarn used for binding gravel bags shall be as recommended by the manufacturer or bag supplier and shall be of a contrasting color.

Gravel shall be between 10 mm and 20 mm in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured to prevent gravel from escaping. Gravel-filled bags shall be between 13 kg and 22 kg in mass.

Silt Fence Fabric

Silt fence fabric for temporary drainage inlet protection shall be geotextile manufactured from woven polypropylene or polymer material. Silt Fence Fabric may be virgin or recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled polymer materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Silt fence fabric shall conform to the following requirements:

Specification	Requirements
Width, mm, min.	900
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632*	0.55
Elongation, percent minimum in each direction ASTM Designation: D 4632*	15
Permittivity, l/sec., min. ASTM Designation: D 4491	0.05
Flow rate, liters per minute per square meter, min. ASTM Designation: D 4491	400
Ultraviolet stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	70

* or appropriate test method for specific polymer

Posts

Posts for temporary silt fence shall be one of the following:

- A. Posts (temporary silt fence) shall be fir or pine, a minimum 50 mm x 50 mm in size, and 1.2 m in length. One end of the post shall be pointed. Wood preservative treatment will not be required for wood posts.
- B. Posts (temporary silt fence) shall be steel and have a "U", "T", "L" or other cross sectional shape that can resist failure by lateral loads. The steel posts shall have a minimum mass per length of 1.1 kg/m and a minimum length of 1.2 m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Engineer for approval a sample of the capped steel post prior to installation.

Fasteners

Fasteners for attaching silt fence fabric to posts shall be as follows:

- A. When prefabricated silt fence is used, posts shall be inserted into sewn pockets.

- B. Silt fence fabric shall be attached to wooden posts with nails or staples as shown on the plans or as recommended by the manufacturer or supplier. Tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts. Maximum spacing of fasteners shall be 200 mm along the length of the steel post.

Foam Barrier

Foam barrier fabric cover and skirt for temporary drainage inlet protection (Type 4B) shall be a woven polypropylene fabric with a minimum tensile strength of 0.44-kN, conforming to ASTM Designation: D 4632. The prefabricated fabric shall be high visibility orange in color that is integral to the fabric; painting shall not be allowed. The fabric shall have an ultraviolet (UV) stability exceeding 70 percent.

Foam core (foam barrier) shall be urethane foam and shall be shaped and dimensioned as shown on the plans.

Adhesive for foam barrier shall be a solvent free rubber modified asphalt emulsion. The color of the emulsion shall be brown when wet and shall have a drying period of not more than 3 hours.

Anchoring nails or spikes for foam barrier shall be a minimum of 25 mm in length and capable of penetrating concrete and asphalt surfaces.

Sediment Filter Bag

Sediment filter bag for temporary drainage inlet protection (Type 5) shall be manufactured from sediment filter bag fabric. The sediment filter bag shall be sized to fit the catch basin or drainage inlet and be complete with lifting loops and dump straps attached at the bottom to facilitate emptying of the sediment filter bag. The sediment filter bags shall have a restraint cord approximately halfway up the bag to keep the sides away from the catch basin walls.

Sediment filter bag fabric shall be geotextile manufactured from woven polypropylene or polymer material. Sediment filter bag fabric may be virgin or recycled, or a combination of virgin and recycled polymer materials. No virgin or recycled polymer materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Sediment filter bag fabric shall conform to the following requirements:

Specification	Requirements
Grab tensile strength (25-mm grip), kilonewtons, min. in each direction ASTM Designation: D 4632*	1.35
Elongation, percent minimum in each direction ASTM Designation: D 4632*	20
Permittivity, l/sec., min. ASTM Designation: D 4491	0.55
Flow rate, liters per minute per square meter, min. ASTM Designation: D 4491	8140
Ultraviolet stability, percent tensile strength retained after 500 hours, min. ASTM Designation: D 4355 (xenon-arc lamp and water spray weathering method)	80

* or appropriate test method for specific polymer

INSTALLATION

Temporary drainage inlet protection shall be installed at drain inlets in paved and unpaved areas as follows:

- Temporary drainage inlet protection shall be installed such that ponded runoff does not encroach into the traveled way or overtop the curb or dike. Gravel-filled bags shall be placed to control ponding and prevent runoff from overtopping the curb or dike.
- The bedding area for the temporary drainage inlet protection shall be cleared of obstructions including, but not limited to, rocks, clods, and debris greater than 25 mm in diameter prior to installation.
- Temporary silt fence shall be installed as necessary up-slope of the existing drainage inlet and parallel to the curb, dike, or flow line to prevent sediment from entering the drainage inlet.
- Temporary drainage inlet protection (Type 1): Erosion control blanket or geotextile fabric shall be secured with staples and embedded into a trench adjacent to the drainage inlet. The silt fence shall be installed along the perimeter of the installed erosion control blanket or geotextile fabric. The silt fence shall be installed with the posts facing the drainage inlet. The silt fence fabric and the perimeter edge of the erosion control blanket or geotextile fabric shall be anchored in a trench. The trench shall be backfilled and mechanically or hand tamped to secure the silt fence fabric in the bottom of the trench.

- E. Temporary drainage inlet protection (Type 2): The area around the drainage inlet shall be excavated to create a sediment trap. Erosion control blanket or geotextile fabric shall be secured to the surface of the excavated sediment trap with staples and embedded into a trench adjacent to the drainage inlet. The silt fence shall be installed along the perimeter of the installed erosion control blanket or geotextile fabric. The silt fence shall be installed with the posts facing the drainage inlet. The silt fence fabric and the perimeter edge of the erosion control blanket or geotextile fabric shall be anchored in a trench. The trench shall be backfilled and mechanically or hand tamped to secure the silt fence fabric in the bottom of the trench.
- F. Temporary drainage inlet protection (Type 3A): Gravel-filled bags shall be stacked in rows two layers high to form a gravel bag barrier. The gravel-filled bags shall be placed so that the bags are tightly abutted and overlap the joints in adjacent rows. A spillway shall be created by removing one or more gravel-filled bags from the upper layer of the gravel bag barrier.
- G. Temporary drainage inlet protection (Type 3B): Erosion control blanket or geotextile fabric shall be secured with staples and embedded into a trench adjacent to the drainage inlet. Gravel-filled bags shall be staked in rows two layers high in a pyramid configuration to form a gravel bag barrier centered over the perimeter of the erosion control blanket or geotextile fabric. The gravel-filled bags shall be placed so that the bags are tightly abutted and overlap the joints in adjacent rows. A spillway shall be created by removing one or more gravel-filled bags from the upper layer of the gravel bag barrier.
- H. Temporary drainage inlet protection (Type 4B): Foam barrier shall consist of individual sections installed in conjunction with one another adjacent to existing drainage inlets. Foam barriers shall be securely attached to the pavement according to the angle and spacing as shown on the plans. Foam barrier shall be installed flush against the sides of concrete or asphalt curbs, dikes and pavement with the inner material and fabric cover cut smoothly and evenly to provide a tight flush joint.
- I. Temporary drainage inlet protection (Type 5): Sediment filter bags shall be installed by removing the drainage inlet grate, placing the sediment bag in the opening, and replacing the grate to secure the sediment filter bag in place.

The Contractor shall select the appropriate drainage inlet protection in conformance with the details to meet the field condition around the drainage inlet. For all other drainage inlets within the project limits that do not conform to the details shown on the plans, the Contractor shall submit to the Engineer for approval, provisions for providing temporary drainage inlet protection.

Details for an alternative temporary drainage inlet protection shall be submitted to the Engineer for approval at least 7 days prior to installation.

Throughout the duration of the Contract, the Contractor shall be required to provide protection to meet the changing condition of the drainage inlet.

When the temporary drainage inlet protections are no longer required, temporary drainage inlet protection materials shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Holes, depressions or other ground disturbance caused by the removal of the temporary drainage inlet protection shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

MAINTENANCE

Temporary drainage inlet protection shall be maintained to provide sediment holding capacity and to reduce runoff velocities and as follows:

- A. Gravel-filled bags shall be replaced when the bag material ruptures and allows the contents to spill out, or when the yarn fails and allows the bag contents to spill out.
- B. Temporary silt fence shall be repaired or replaced when silt fence fabric becomes split, torn, or unraveled. Broken or split stakes shall be replaced. Sagging or slumping silt fence shall be repaired with additional stakes or replaced.
- C. Locations where rills and other evidence of concentrated runoff have occurred beneath the fiber rolls, silt fences, foam barriers, or gravel bag barriers shall be corrected.
- D. Sediment deposits, trash and debris shall be removed from temporary drainage inlet as described in this special provision or as directed by the Engineer. Removed sediment shall be deposited within the project limits in such a way that the sediment is not subject to erosion by wind or by water. Trash and debris shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
- E. Temporary drainage inlet protection (Type 1): Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately one-third the height of the silt fence fabric above ground. Sediment in excess of 50 mm above the surface of the erosion control blanket or geotextile fabric shall be removed.

- F. Temporary drainage inlet protection (Type 2): Temporary silt fence shall be maintained to provide a sediment holding capacity of approximately one-third the height of the silt fence fabric above ground. Sediment shall be removed from the sediment trap when the volume has been reduced by approximately one-half.
- G. Temporary drainage inlet protection (Type 3A): Sediment deposits shall be removed when the deposit reaches one-third the height of the gravel bag barrier or one-half the height of the spillway; whichever is less.
- H. Temporary drainage inlet protection (Type 3B): Sediment deposits shall be removed when the deposit reaches one-third the height of the gravel bag barrier or one-half the height of the spillway; whichever is less. Sediment in excess of 50 mm above the surface of the erosion control blanket or geotextile fabric shall be removed.
- I. Temporary drainage inlet protection (Type 4B): Foam barriers shall be repaired or replaced when the geotextile fabric cover becomes split, torn, or unraveled. Foam barriers that become detached or dislodged shall be reattached to the pavement. Sediment deposits shall be removed when the deposit reaches one-third of the foam barrier height.
- J. Temporary drainage inlet protection (Type 5): Sediment filter bags shall be emptied when the restraint cords are no longer visible. Emptying of the bag shall be facilitated by the use of 25mm steel reinforcing bars placed through the lifting loops. The sediment bag shall be emptied of material and rinsed before replacement in the catch basin or drainage inlet.

Temporary drainage inlet protection shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary drainage inlet protection resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of temporary drainage inlet protection to be paid for will be measured by the unit as determined from actual count in place. The protection is measured one time only and no additional measurement is recognized and no additional compensation made if the temporary drainage inlet protection changes during the course of construction.

The contract unit price paid for temporary drainage inlet protection of the type shown in the Engineer's Estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the temporary drainage inlet protection, complete in place, including maintenance, removal of materials, and backfilling and repairing holes, depressions and other ground disturbance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary drainage inlet protection required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary drainage inlet protection.

The cost of maintaining the temporary drainage inlet protection will be borne equally by the State and the Contractor.

The division of cost will be made by determining the cost of maintaining temporary drainage inlet protection in conformance with the provisions in Section 9-1.03, "Force Account Payment," of the Standard Specifications and paying to the Contractor one-half of that cost. Clean-up, repair, removal, disposal, replacement because of improper installation, and replacement of temporary drainage inlet protection damaged as a result of the Contractor's negligence will not be considered as included in the cost for performing maintenance.

10-1.10 TEMPORARY CONSTRUCTION ENTRANCE

Temporary construction entrance shall be constructed, maintained, and later removed at the locations shown on the approved Storm Water Pollution Prevention Plan in conformance with "Water Pollution Control" of these special provisions, and in conformance with details shown on the plans and these special provisions.

Attention is directed to "Water Pollution Control" of these special provisions.

Temporary construction entrance shall be one of the water pollution control practices for tracking control. The Storm Water Pollution Prevention Plan shall include the use of temporary construction entrance.

At the option of the Contractor, temporary construction entrance shall be Type 1 or Type 2 .

MATERIALS

Temporary Entrance Fabric

Temporary entrance fabric shall be manufactured from polyester, nylon or polypropylene material or any combination thereof. Temporary entrance fabric shall be a nonwoven, needle-punched fabric, free of any needles which may have broken off during the manufacturing process. Temporary entrance fabric shall be permeable and shall not act as a wicking agent.

Temporary entrance fabric shall be manufactured from virgin or recycled, or a combination of virgin and recycled, polymer materials. No virgin or recycled materials shall contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. The Engineer may order tests to confirm the absence of biodegradable filler materials in conformance to the requirements in ASTM Designation: E 204 (Fourier Transformed Infrared Spectroscopy-FTIR).

Temporary entrance fabric shall conform to the following requirements:

Specification	Requirements
Mass per unit area, grams per square meter, min. ASTM Designation: D 5261	235
Grab tensile strength (25-mm grip), kilonewtons, min. ASTM Designation: D4632*	0.89
Elongation at break, percent min. ASTM Designation: D4632*	50
Toughness, kilonewtons, min. (percent elongation x grab tensile strength)	53

* or appropriate test method for specific polymer

Rocks

Rocks shall be angular to subangular in shape, and shall conform to the material quality requirements in Section 72-2.02, "Materials," of the Standard Specifications for apparent specific gravity, absorption, and durability index. Rocks used for the temporary entrance shall conform to the following sizes:

Square Screen Size (mm)	Percentage Passing
150	100
75	0-20

Corrugated Steel Panels

Corrugated steel panels shall be prefabricated and shall be pressed or shop welded, with a slot or hooked section to facilitate coupling at the ends of the panels.

INSTALLATION

Temporary construction entrance shall be installed as follows:

- A. Prior to placing the temporary entrance fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.
- B. A sump shall be constructed within 6 m of each temporary construction entrance as shown on the plans. The exact location of the sump will be determined by the Engineer.
- C. Before placing the temporary entrance fabric, the ground shall be graded to a uniform plane. The relative compaction of the top 0.5-m shall be not less than 90 percent. The ground surface shall be free of sharp objects that may damage the temporary entrance fabric, and shall be graded to drain to the sump as shown on the plans.
- D. Temporary entrance fabric shall be positioned longitudinally along the alignment of the entrance, as directed by the Engineer.
- E. The adjacent ends of the fabric shall be overlapped a minimum length of 300 mm.
- F. Rocks to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance.
- G. During spreading of the rocks, vehicles or equipment shall not be driven directly on the fabric. A layer of rocks of minimum 150 mm thick shall be placed between the fabric and the spreading equipment to prevent damage to the fabric.
- H. For Type 2 temporary construction entrance, a minimum of 6 coupled panel sections shall be installed for each temporary construction entrance. Prior to installing the panels, the ground surface shall be cleared of all debris to ensure uniform contact with the ground surface.

Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 450-mm overlap on all edges.

Details for alternative temporary construction entrance shall be submitted to the Engineer for approval at least 7 days prior to installation.

If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional corrugated steel panels and spread additional rocks to increase the capacity of the temporary construction entrance at the Contractor's expenses.

When no longer required as determined by the Engineer, temporary construction entrances shall become the property of the Contractor and be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Ground disturbance, including holes and depressions, caused by the installation and removal of the temporary construction entrance, including the sumps, shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities.

MAINTENANCE

The Contractor shall maintain temporary construction entrance throughout the contract or until removed. The Contractor shall prevent displacement or migration of the rock surfacing or corrugated steel panels. Any significant depressions resulted from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer.

Temporary construction entrance shall be maintained to minimize tracking of soil and sediment onto existing public roads.

Temporary construction entrance shall be repaired or replaced on the same day when the damage occurs. Damage to the temporary construction entrance resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

MEASUREMENT AND PAYMENT

The quantity of temporary construction entrance to be paid for will be measured as unit determined from actual count in place.

The contract unit price paid for temporary construction entrance shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing temporary construction entrance, complete in place, including excavation and backfill, maintenance, and removal of temporary construction entrance, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of temporary construction entrance required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to temporary construction entrance.

10-1.11 COOPERATION

Attention is directed to Section 7-1.14, "Cooperation," and Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications and these special provisions.

It is anticipated that the following works by another contractor may be in progress adjacent to or within the limits of this project during progress of the work on this contract.

Contract No. 174504 Realign Ramp/Install Traffic Signal in City of San Leandro in Alameda County on Route 880 (KP 20.8 to KP20.9)

Contract No. 249004 Widening I-238 in and near City of San Leandro in Alameda County on Route 880 /238 (R14.2/16.7) 580(R29.4/31.4) 880 (18.3/20.7)

Work by State forces will be in progress within the contract limits during the working period for this contract.

The Contractor shall comply with all security policies and normal working hours of the State concerning the South Oakland Maintenance Station.

The Contractor shall plan his work to minimize interference with State forces and the public. Interruptions to any services for the purpose of making or breaking a connection shall be made only after consultation with and for such time periods as directed by the Engineer.

10-1.12 TIME-RELATED OVERHEAD

The Contractor will be compensated for time-related overhead as described below and in conformance with "Force Account Payment" of these special provisions. The Contractor will not be compensated for time-related overhead for delays to the controlling operations caused by the Engineer that occur prior to the first working day, but will be compensated for actual overhead costs incurred, as determined by an independent Certified Public Accountant audit examination and report.

Attention is directed to "Beginning of Work, Time of Completion and Liquidated Damages," "Force Account Payment," and "Progress Schedule (Critical Path Method)" of these special provisions.

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The provisions in Section 9-1.08, "Adjustment of Overhead Costs," of the Standard Specifications shall not apply.

Time-related overhead shall consist of those overhead costs, including field and home office overhead, that are in proportion to the time required to complete the work. Time-related overhead shall not include costs that are not related to time, including but not limited to, mobilization, licenses, permits, and other charges incurred only once during the contract. Time-related overhead shall not apply to subcontractors of any tier, suppliers, fabricators, manufacturers, or other parties associated with the Contractor.

Field office overhead expenses include time-related costs associated with the normal and recurring operations of the construction project, and shall not include costs directly attributable to the work of the contract. Time-related costs of field office overhead include, but are not limited to, salaries, benefits, and equipment costs of project managers, general superintendents, field office managers and other field office staff assigned to the project, and rent, utilities, maintenance, security, supplies, and equipment costs of the project field office.

Home office overhead or general and administrative expenses refer to the fixed costs of operating the Contractor's business. These costs include, but are not limited to, general administration, insurance, personnel and subcontract administration, purchasing, accounting, and project engineering and estimating. Home office overhead costs shall exclude expenses specifically related to other contracts or other businesses of the Contractor, equipment coordination, material deliveries, and consultant and legal fees.

The quantity of time-related overhead associated with a reduction in contract time for cost reduction incentive proposals accepted and executed in conformance with the provisions in Section 5-1.14, "Cost Reduction Incentive," of the Standard Specifications shall be considered a construction cost attributable to the resultant estimated net savings due to the cost reduction incentive.

If the final increased quantity of time-related overhead exceeds 149 percent of the number of working days specified in the Engineer's Estimate, the Contractor shall, within 60 days of the Engineer's written request, submit to the Engineer an audit examination and report performed by an independent Certified Public Accountant of the Contractor's actual overhead costs. The audit examination and report shall depict the Contractor's project and company-wide financial records and shall specify the actual overall average daily rates for both field and home office overhead for the entire duration of the project, and whether the costs have been properly allocated. The rates of field and home office overhead shall exclude unallowable costs as determined in the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.

Independent Certified Public Accountant's audit examinations shall be performed in conformance with the requirements of the American Institute of Certified Public Accountants Attestation Standards. Audit examinations and reports shall determine if the rates of field office overhead and home office overhead are:

- A. Allowable in conformance with the requirements of the Federal Acquisition Regulations, 48 CFR, Chapter 1, Part 31.
- B. Adequately supported by reliable documentation.
- C. Related solely to the project under examination.

Within 20 days of receipt of the Engineer's written request, the Contractor shall make its financial records available for audit by the State for the purpose of verifying the actual rate of time-related overhead specified in the audit submitted by the Contractor. The actual rate of time-related overhead specified in the audit, submitted by the Contractor, will be subject to approval by the Engineer.

If the Engineer requests the independent Certified Public Accountant audit, or if it is requested in writing by the Contractor, the contract item payment rate for time-related overhead, in excess of 149 percent of the number of working days specified in the Engineer's Estimate, will be adjusted to reflect the actual rate.

The cost of performing an independent Certified Public Accountant audit examination and submitting the report, requested by the Engineer, will be borne equally by the State and the Contractor. The division of the cost will be made by determining the cost of providing an audit examination and report in conformance with the provisions of Section 9-1.03B, "Work Performed by Special Forces or Other Special Services," of the Standard Specifications, and paying to the Contractor one-half of that cost. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report for overhead claims other than for the purpose of verifying the actual rate of time-related overhead shall be entirely borne by the Contractor. The cost of performing an audit examination and submitting the independent Certified Public Accountant audit report to verify actual overhead costs incurred prior to the first working day shall be entirely borne by the Contractor.

The quantity of time-related overhead to be paid will be measured by the working day, designated in the Engineer's Estimate as WDAY. The estimated number of working days is the number of working days, excluding days for plant establishment, as specified in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions. The quantity of time-related overhead will be increased or decreased only as a result of suspensions or adjustments of contract time which revise the current contract completion date, and which satisfy any of the following criteria:

- A. Suspensions of work ordered in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications, except:
 - 1. Suspensions ordered due to weather conditions being unfavorable for the suitable prosecution of the controlling operation or operations.
 - 2. Suspensions ordered due to the failure on the part of the Contractor to carry out orders given, or to perform the provisions of the contract.
 - 3. Suspensions ordered due to factors beyond the control of and not caused by the State or the Contractor, for which the Contractor is granted extensions of time in conformance with the provisions of the third paragraph of Section 8-1.07, "Liquidated Damages," of the Standard Specifications.
 - 4. Other suspensions that mutually benefit the State and the Contractor.
- B. Extensions of contract time granted by the State in conformance with the provisions in the fifth paragraph in Section 8-1.07, "Liquidated Damages," of the Standard Specifications and set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.
- C. Reductions in contract time set forth in approved contract change orders, in conformance with the provisions in Section 4-1.03, "Changes," of the Standard Specifications.

In the event an early completion progress schedule, as defined in "Progress Schedule (Critical Path Method)" of these special provisions, is submitted by the Contractor and approved by the Engineer, the amount of time-related overhead eligible for payment will be based on the total number of working days for the project, in conformance with the provisions in "Beginning of Work, Time of Completion and Liquidated Damages" of these special provisions, rather than the Contractor's early completion progress schedule.

The contract price paid per working day for time-related overhead shall include full compensation for time-related overhead, including the Contractor's share of costs of the independent Certified Public Accountant audit of overhead costs requested by the Engineer, as specified in these special provisions, and as directed by the Engineer.

The provisions in Sections 4-1.03B, "Increased or Decreased Quantities," and 4-1.03C, "Changes in Character of the Work," of the Standard Specifications shall not apply to the contract item of time-related overhead.

Full compensation for additional overhead costs incurred during days of inclement weather when the contract work is extended into additional construction seasons due to delays caused by the State shall be considered as included in the time-related overhead paid during the contract working days, and no additional compensation will be allowed therefor.

Full compensation for additional overhead costs involved in performing additional contract item work that is not a controlling operation shall be considered as included in the contract items of work involved and no additional compensation will be allowed therefor.

Full compensation for overhead, other than time-related overhead measured and paid for as specified above, and other than overhead costs included in the markups specified in "Force Account Payment" of these special provisions, shall be considered as included in the various items of work and no additional compensation will be allowed therefor.

Overhead costs incurred by subcontractors of any tier, suppliers, fabricators, manufacturers, and other parties associated with the Contractor shall be considered as included in the various items of work and as specified in Section 9-1.03, "Force Account Payment," of the Standard Specifications.

For the purpose of making partial payments pursuant to the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications, the number of working days to be paid for time-related overhead in each monthly partial payment will be the number of working days, specified above to be measured for payment that occurred during that monthly estimate period, including compensable suspensions and right of way delays. Working days granted by contract change order due to extra work or changes in character of the work, will be paid for upon completion of the contract. The amount earned per working day for time-related overhead shall be the lesser of the following amounts:

- A. The contract item price.
- B. Twenty percent of the original total contract amount divided by the number of working days specified in "Beginning of Work, Time of Completion and Liquidated Damages," of these special provisions.

After the work has been completed, except plant establishment work, as provided in Section 20-4.08, "Plant Establishment Work," of the Standard Specifications, the amount of the total contract item price for time-related overhead not yet paid will be included for payment in the first estimate made after completion of roadway construction work, in conformance with the provisions in Section 9-1.06, "Partial Payments," of the Standard Specifications.

10-1.13 OBSTRUCTIONS

Attention is directed to Section 8-1.10, "Utility and Non-Highway Facilities," and Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

Attention is directed to the existence of certain underground facilities that may require special precautions be taken by the Contractor to protect the health, safety and welfare of workers and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine, and toxic or flammable gases; natural gas in pipelines greater than 150 mm in diameter or pipelines operating at pressures greater than 415 kPa (gage); underground electric supply system conductors or cables, with potential to ground of more than 300 V, either directly buried or in a duct or conduit which do not have concentric grounded or other effectively grounded metal shields or sheaths.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include, but are not limited to, the following:

Notification Center	Telephone Number
Underground Service Alert-Northern California (USA)	1-800-642-2444 1-800-227-2600
Underground Service Alert-Southern California (USA)	1-800-422-4133 1-800-227-2600

Installation of the following utility facilities will require coordination with the Contractor's operations. The Contractor shall make the necessary arrangements with the utility company, through the Engineer, and shall submit a schedule of work, verified by a representative of the utility company, to the Engineer. The schedule of work shall provide not less than the following number of working days, as defined in Section 8-1.06, "Time of Completion," of the Standard Specifications for the utility company to complete their work:

Utility (address)	Location	Working Days
EBMUD	Hesperian Blvd	10
PG&E	Hesperian Blvd	20
SBC	Hesperian Blvd	10
????/Anitary District	Within Bldg Site	10

In the event that the utility facilities mentioned above are not removed or relocated by the date specified and, if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with by reason of the utility facilities not being removed or relocated by the date specified, the State will compensate the Contractor for the delays to the extent provided in Section 8-1.09, "Right of Way Delays," of the Standard Specifications, and not otherwise, except as provided in Section 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

10-1.14 CONSTRUCTION AREA TRAFFIC CONTROL DEVICES

Flagging, signs, and all other traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Category 1 traffic control devices are defined as those devices that are small and lightweight (less than 45 kg), and have been in common use for many years. The devices shall be known to be crashworthy by crash testing, crash testing of similar devices, or years of demonstrable safe performance. Category 1 traffic control devices include traffic cones, plastic drums, portable delineators, and channelizers.

If requested by the Engineer, the Contractor shall provide written self-certification for crashworthiness of Category 1 traffic control devices. Self-certification shall be provided by the manufacturer or Contractor and shall include the following: date, Federal Aid number (if applicable), expenditure authorization, district, county, route and kilometer post of project limits; company name of certifying vendor, street address, city, state and zip code; printed name, signature and title of certifying person; and an indication of which Category 1 traffic control devices will be used on the project. The Contractor may obtain a standard form for self-certification from the Engineer.

Category 2 traffic control devices are defined as those items that are small and lightweight (less than 45 kg), that are not expected to produce significant vehicular velocity change, but may otherwise be potentially hazardous. Category 2 traffic control devices include: barricades and portable sign supports.

Category 2 devices purchased on or after October 1, 2000 shall be on the Federal Highway Administration (FHWA) Acceptable Crashworthy Category 2 Hardware for Work Zones list. This list is maintained by FHWA and can be located at

the following internet address: <http://safety.fhwa.dot.gov/fourthlevel/hardware/listing.cfm?code=workzone>. The Department maintains a secondary list at the following internet address: <http://www.dot.ca.gov/hq/traffops/signtech/signdel/pdf.htm>.

Category 2 devices that have not received FHWA acceptance, and were purchased before October 1, 2000, may continue to be used until they complete their useful service life or until January 1, 2003, whichever comes first. Category 2 devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer by the start of the project. The label shall be readable. After January 1, 2003, all Category 2 devices without a label shall not be used on the project.

If requested by the Engineer, the Contractor shall provide a written list of Category 2 devices to be used on the project at least 5 days prior to beginning any work using the devices. For each type of device, the list shall indicate the FHWA acceptance letter number and the name of the manufacturer.

Full compensation for providing self-certification for crashworthiness of Category 1 traffic control devices and for providing a list of Category 2 devices used on the project and labeling Category 2 devices as specified shall be considered as included in the prices paid for the various contract items of work requiring the use of the Category 1 or Category 2 traffic control devices and no additional compensation will be allowed therefor.

At locations where falsework pavement lighting or pedestrian openings through falsework are designated, falsework lighting shall be installed in conformance with the provisions in Section 86-6.11, "Falsework Lighting," of the Standard Specifications.

Openings shall be provided through bridge falsework for the use of public traffic at each location where falsework is constructed over the streets or routes listed in the following table. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of falsework lighting, if required for each opening, shall conform to the requirements in the table. The width of vehicular openings shall be the clear width between temporary railings or other protective work. The spacing shown for falsework pavement lighting is the maximum distance center to center in meters between fixtures.

	Number	Width	Height
Vehicle Openings			
Pedestrian Openings			
	Location		Spacing
Falsework Pavement Lighting			

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

	Number	Width	Height
Vehicle Openings			
Pedestrian Openings			
	Location		Spacing
Falsework Pavement Lighting			

(Width and Height in meters)
(R = Right side of traffic. L = Left side of traffic)
(C = Centered overhead)

At the following location, no temporary railing is required. In addition to the falsework pavement lighting specified, each side of each vehicular passageway between portals shall be illuminated by a string of yellow 25-W lamps spaced at 3.6 m intervals, mounted at a height of 2.4 to 2.6 meters above the pavement:

	Number	Width	Height
Vehicle Openings			
Pedestrian Openings			
	Location	Spacing	
Falsework Pavement Lighting			

(Width and Height in meters)

(R = Rght side of traffic. L = Left side of traffic)

The exact location of openings will be determined by the Engineer.

10-1.15 MAINTAINING TRAFFIC

Attention is directed to Sections 7-1.08, "Public Convenience," 7-1.09, "Public Safety," and 12, "Construction Area Traffic Control Devices," of the Standard Specifications and to the provisions in "Public Safety" of these special provisions and these special provisions. Nothing in these special provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7-1.09.

Lane closures shall conform to the provisions in section "Traffic Control System for Lane Closure" of these special provisions.

Personal vehicles of the Contractor's employees shall not be parked on the traveled way or shoulders including any section closed to public traffic.

The Contractor shall notify local authorities of the Contractor's intent to begin work at least 5 days before work is begun. The Contractor shall cooperate with local authorities relative to handling traffic through the area and shall make arrangements relative to keeping the working area clear of parked vehicles.

Whenever work vehicles or equipment are parked on the shoulder within 1.8 m of a traffic lane, the shoulder area shall be closed with fluorescent orange traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at 7.5-meter intervals to a point not less than 7.5 m past the last vehicle or piece of equipment. A minimum of 9 traffic cones or portable delineators shall be used for the taper. A W20-1 (ROAD WORK AHEAD) or W21-5b (RIGHT/LEFT SHOULDER CLOSED AHEAD) or C24(CA) (SHOULDER WORK AHEAD) sign shall be mounted on a portable sign stand with flags. The sign shall be placed where designated by the Engineer. The sign shall be a minimum of 1200 mm x 1200 mm in size. The Contractor shall immediately restore to the original position and location a traffic cone or delineator that is displaced or overturned, during the progress of work.

Lanes shall be closed only during the hours shown on the charts included in this section "Maintaining Traffic." Except work required under Sections 7-1.08 and 7-1.09, work that interferes with public traffic shall be performed only during the hours shown for lane closures.

Designated legal holidays are: January 1st, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, November 11th, Thanksgiving Day, and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal holiday.

Minor deviations from the requirements of this section concerning hours of work which do not significantly change the cost of the work may be permitted upon the written request of the Contractor, if in the opinion of the Engineer, public traffic will be better served and the work expedited. These deviations shall not be adopted by the Contractor until the Engineer has approved the deviations in writing. All other modifications will be made by contract change order.

Chart No.1 Multilane Lane Requirements																									
Location: Northbound Route 880 Connector to Southbound Route 238																									
FROM HOUR TO HOUR	a.m.												p.m.												
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Mondays through Thursdays	1	1	1	1	1																				
Fridays	1	1	1	1	1																				
Saturdays		1	1	1	1	1																			
Sundays	1	1	1	1	1	1	1	1																	
Day before designated legal holiday	1	1	1	1	1																				
Designated legal holidays	1	1	1	1	1	1	1	1	1																
Legend:																									
1	Connector may be completely closed.																								
	No connector closure allowed																								
REMARKS: See Detour Plan No. 1 on CS-2																									

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Chart No. 2 Ramp Lane Requirements																										
Location: Southbound Route 238 On Ramp from Hesperian Blvd (PM 16.321)																										
FROM HOUR TO HOUR	a.m.												p.m.													
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Mondays through Thursdays	X	X	X	X	X	X																	X	X	X	
Fridays	X	X	X	X	X	X																	X	X	X	
Saturdays	X	X	X	X	X	X	X	X	X														X	X	X	
Sundays	X	X	X	X	X	X	X	X	X	X	X												X	X	X	
Day before designated legal holiday	X	X	X	X	X	X																	X	X	X	
Designated legal holidays	X	X	X	X	X	X	X	X	X	X	X												X	X	X	
Legend:																										
<div>X</div> Ramp may be closed																										
<div></div> No ramp closure permitted.																										
REMARKS: SEE DETOUR PLAN No. 2 on CS-2																										

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10-1.16 CLOSURE REQUIREMENTS AND CONDITIONS

Lane closures shall conform to the provisions in "Maintaining Traffic" of these special provisions and these special provisions.

The term closure, as used herein, is defined as the closure of a traffic lane or lanes, including ramp or connector lanes, within a single traffic control system.

CLOSURE SCHEDULE

By noon Monday, the Contractor shall submit a written schedule of planned closures for the following week period, defined as Friday noon through the following Friday noon.

The Closure Schedule shall show the locations and times when the proposed closures are to be in effect. The Contractor shall use the Closure Schedule request forms furnished by the Engineer. Closure Schedules submitted to the Engineer with incomplete, unintelligible or inaccurate information will be returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.

Amendments to the Closure Schedule, including adding additional closures, shall be submitted to the Engineer, in writing, at least 3 working days in advance of a planned closure. Approval of amendments to the Closure Schedule will be at the discretion of the Engineer.

The Contractor shall confirm, in writing, all scheduled closures by no later than 8:00 a.m. 3 working days prior to the date on which the closure is to be made. Approval or denial of scheduled closures will be made no later than 4:00 p.m. 2 working days prior to the date on which the closure is to be made. Closures not confirmed or approved will not be allowed.

Confirmed closures that are cancelled due to unsuitable weather may be rescheduled at the discretion of the Engineer for the following working day.

CONTINGENCY PLAN

The Contractor shall prepare a contingency plan for reopening closures to public traffic. The Contractor shall submit the contingency plan for a given operation to the Engineer within one working day of the Engineer's request.

LATE REOPENING OF CLOSURES

If a closure is not reopened to public traffic by the specified time, work shall be suspended in conformance with the provisions in Section 8-1.05, "Temporary Suspension of Work," of the Standard Specifications. The Contractor shall not make any further closures until the Engineer has accepted a work plan, submitted by the Contractor, that will insure that future closures will be reopened to public traffic at the specified time. The Engineer will have 2 working days to accept or reject the Contractor's proposed work plan. The Contractor will not be entitled to any compensation for the suspension of work resulting from the late reopening of closures.

For each 10-minute interval, or fraction thereof past the time specified to reopen the closure, the Department will deduct \$1,300 per interval from moneys due or that may become due the Contractor under the contract.

COMPENSATION

The Contractor shall notify the Engineer of any delay in the Contractor's operations due to the following conditions, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of those conditions, and the Contractor's loss due to that delay could not have been avoided by rescheduling the affected closure or by judicious handling of forces, equipment and plant, the delay will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09:

- A. The Contractor's proposed Closure Schedule is denied and his planned closures are within the time frame allowed for closures in "Maintaining Traffic" of these special provisions, except that the Contractor will not be entitled to any compensation for amendments to the Closure Schedule that are not approved.
- B. The Contractor is denied a confirmed closure.

Should the Engineer direct the Contractor to remove a closure prior to the time designated in the approved Closure Schedule, any delay to the Contractor's schedule due to removal of the closure will be considered a right of way delay within the meaning of Section 8-1.09, "Right of Way Delays," and compensation for the delay will be determined in conformance with the provisions in Section 8-1.09.

10-1.17 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes and ramps in conformance with the details shown on the plans, the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications, the provisions under "Maintaining Traffic" and "Construction Area Signs" of these special provisions, and these special provisions.

The provisions in this section will not relieve the Contractor from the responsibility to provide additional devices or take measures as may be necessary to comply with the provisions in Section 7-1.09, "Public Safety," of the Standard Specifications.

Each vehicle used to place, maintain and remove components of a traffic control system on multilane highways shall be equipped with a Type II flashing arrow sign which shall be in operation when the vehicle is being used for placing, maintaining or removing components. Vehicles equipped with Type II flashing arrow sign not involved in placing, maintaining or removing components when operated within a stationary lane closure shall only display the caution display mode. The sign shall be controllable by the operator of the vehicle while the vehicle is in motion. The flashing arrow sign shown on the plans shall not be used on vehicles which are being used to place, maintain and remove components of a traffic control system and shall be in place before a lane closure requiring its use is completed.

The 500 m section of lane closure, shown along lane lines between the 300 m lane closure tapers on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be used.

The traffic cones shown to be placed transversely across closed traffic lanes and shoulders on the plans entitled "Traffic Control System for Lane Closures on Freeways and Expressways" and "Traffic Control System for Lane and Complete Closures on Freeways and Expressways" shall not be placed.

If components in the traffic control system are displaced or cease to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the components to the original condition or replace the components and shall restore the components to the original location.

When lane and ramp closures are made for work periods only, at the end of each work period, components of the traffic control system, except portable delineators placed along open trenches or excavation adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations designated by the Engineer within the limits of the highway right of way.

The contract lump sum price paid for traffic control system shall include full compensation for furnishing all labor, materials (including signs), tools, equipment, and incidentals, and for doing all the work involved in placing, removing, storing, maintaining, moving to new locations, replacing, and disposing of the components of the traffic control system shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The adjustment provisions in Section 4-1.03, "Changes," of the Standard Specifications shall not apply to the item of traffic control system. Adjustments in compensation for traffic control system will be made only for increased or decreased traffic control system required by changes ordered by the Engineer and will be made on the basis of the cost of the increased or decreased traffic control necessary. The adjustment will be made on a force account basis as provided in Section 9-1.03, "Force Account Payment," of the Standard Specifications for increased work and estimated on the same basis in the case of decreased work.

Traffic control system required by work which is classed as extra work, as provided in Section 4-1.03D of the Standard Specifications, will be paid for as a part of the extra work.

10-1.18 TEMPORARY PAVEMENT DELINEATION

Temporary pavement delineation shall be furnished, placed, maintained, and removed in conformance with the provisions in Section 12-3.01, "General," of the Standard Specifications and these special provisions. Nothing in these special provisions shall be construed as reducing the minimum standards specified in the MUTCD, the MUTCD California Supplement, or as relieving the Contractor from the responsibilities specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

GENERAL

Whenever the work causes obliteration of pavement delineation, temporary or permanent pavement delineation shall be in place prior to opening the traveled way to public traffic. Laneline or centerline pavement delineation shall be provided at all times for traveled ways open to public traffic.

Work necessary, including required lines or marks, to establish the alignment of temporary pavement delineation shall be performed by the Contractor. Surfaces to receive temporary pavement delineation shall be dry and free of dirt and loose material. Temporary pavement delineation shall not be applied over existing pavement delineation or other temporary pavement delineation. Temporary pavement delineation shall be maintained until superseded or replaced with a new pattern of temporary pavement delineation or permanent pavement delineation.

Temporary pavement markers and removable traffic tape which conflicts with a new traffic pattern or which is applied to the final layer of surfacing or existing pavement to remain in place shall be removed when no longer required for the direction of public traffic, as determined by the Engineer.

TEMPORARY LANELINE AND CENTERLINE DELINEATION

Whenever lanelines and centerlines are obliterated, the minimum laneline and centerline delineation to be provided shall be temporary raised pavement markers placed at longitudinal intervals of not more than 7.3 m. The temporary raised pavement markers shall be the same color as the laneline or centerline the markers replace. Temporary raised pavement markers shall be, at the option of the Contractor, one of the temporary pavement markers listed for short term day/night use

(14 days or less) or long term day/night use (6 months or less) in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary raised pavement markers shall be placed in conformance with the manufacturer's instructions and shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used to place pavement markers in areas where removal of the markers will be required.

Temporary laneline or centerline delineation consisting entirely of temporary raised pavement markers placed on longitudinal intervals of not more than 7.3 m shall be used on lanes open to public traffic for a maximum of 14 days. Prior to the end of the 14 days, the permanent pavement delineation shall be placed. If the permanent pavement delineation is not placed within the 14 days, additional temporary pavement delineation shall be provided at the Contractor's expense. The additional temporary pavement delineation to be provided shall be equivalent to the pattern specified for the permanent pavement delineation for the area, as determined by the Engineer.

Where "no passing" centerline pavement delineation is obliterated, the following "no passing" zone signing shall be installed prior to opening the lanes to public traffic. W20-1 (ROAD WORK AHEAD) signs shall be installed from 300 m to 600 m in advance of "no passing" zones. R4-1 (DO NOT PASS) signs shall be installed at the beginning and at every 600-m interval within "no passing" zones. For continuous zones longer than 3 km, W7-3a or W71(CA) (NEXT _____ MILES) signs shall be installed beneath the W20-1 signs installed in advance of "no passing" zones. R4-2 (PASS WITH CARE) signs shall be installed at the end of "no passing" zones. The exact location of "no passing" zone signing will be as determined by the Engineer and shall be maintained in place until permanent "no passing" centerline pavement delineation has been applied. The signing for "no passing" zones shall be removed when no longer required for the direction of public traffic. The signing for "no passing" zones shall conform to the provisions in "Construction Area Signs" of these special provisions, except for payment.

Full compensation for furnishing, placing, maintaining, and removing the temporary raised pavement markers used for temporary laneline and centerline delineation (including the signing specified for "no passing" zones) and for providing equivalent patterns of permanent traffic lines for these areas when required shall be considered as included in the contract prices paid for the items of work that obliterated the laneline and centerline pavement delineation and no separate payment will be made therefor.

10-1.19 PORTABLE CHANGEABLE MESSAGE SIGN

Portable changeable message signs shall be furnished, placed, operated, and maintained at those locations shown on the plans or where designated by the Engineer in conformance with the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Location of portable changeable message signs will be determined by the Engineer.

10-1.20 TEMPORARY RAILING

Temporary railing (Type K) shall be placed as shown on the plans, as specified in the Standard Specifications or these special provisions or where ordered by the Engineer and shall conform to the provisions in Section 12, "Construction Area Traffic Control Devices," of the Standard Specifications and these special provisions.

Reflectors on temporary railing (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Temporary railing (Type K) shall conform to the details shown on Standard Plan T3. Temporary railing (Type K) fabricated prior to January 1, 1993, and conforming to 1988 Standard Plan B11-30 may be used, provided the fabrication date is printed on the required Certificate of Compliance.

Attention is directed to "Public Safety" and "Order of Work" of these special provisions.

Temporary railing (Type K) placed in conformance with the provisions in "Public Safety" of these special provisions will be neither measured nor paid for.

10-1.21 TEMPORARY CRASH CUSHION MODULE

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Attention is directed to "Public Safety", "Order of Work", and "Temporary Railing" of these special provisions.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 4.6 m or more from a lane carrying public traffic and the temporary crash cushion

is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work.

At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or TraFFix Sand Barrels manufactured after March 31, 1997, or equal:

- A. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., One East Wacker Drive, Chicago, IL 60601-2076. Telephone 1-312-467-6750, FAX 1-800-770-6755
 - 1. Distributor (North): Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828. Telephone 1-800-884-8274, FAX 1-916-387-9734
 - 2. Distributor (South): Traffic Control Service, Inc., 1881 Betmor Lane, Anaheim, CA 92805. Telephone 1-800-222-8274, FAX 1-714-937-1070
- B. TraFFix Sand Barrels, manufactured by TraFFix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672. Telephone 1-949 361-5663, FAX 1-949 361-9205
 - 1. Distributor (North): United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112. Telephone 1-408 287-4303, FAX 1-408 287-1929
 - 2. Distributor (South): Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448. Telephone 1-800-559-7080, FAX 1-805 929-5786

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape.

Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in kilograms for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules shall be placed on movable pallets or frames conforming to the dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with the provisions in "Public Safety" of these special provisions and modules placed in excess of the number specified or shown will not be measured nor paid for repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled

temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.22 EXISTING HIGHWAY FACILITIES

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

Traffic stripe and pavement marking shall be removed at the locations shown on the plans and as directed by the Engineer.

Attention is directed to "Water Pollution Control" of these special provisions.

Waste from removal of yellow thermoplastic traffic contains lead chromate in average concentrations greater than or equal to 5 mg/L Soluble Lead or 1000 mg/kg Total Lead. Yellow thermoplastic traffic stripe exist in Area 2 of the project limits. Residue produced from when yellow thermoplastic are removed may contain heavy metals in concentrations that exceed thresholds established by the California Health and Safety Code and may produce toxic fumes when heated.

The removed yellow thermoplastic shall be disposed of at a Class 1 disposal facility or a Class 2 disposal facility permitted by the Regional Water Quality Control Board in conformance with the requirements of the disposal facility operator within 30 days after accumulating 100 kg of residue and dust. The Contractor shall make necessary arrangements with the operator of the disposal facility to test the yellow thermoplastic residue as required by the facility and these special provisions. Testing shall include, at a minimum, (1) Total Lead and Chromium by EPA Method 7000 series and (2) Soluble Lead and Chromium by California Waste Extraction Test. From the first 3360 L of waste or portion thereof, if less than 3360 L of waste are produced, a minimum of four randomly selected samples shall be taken and analyzed. From each additional 840 L of waste or portion thereof, if less than 840 L are produced, a minimum of one additional random sample shall be taken and analyzed. The Contractor shall submit the name and location of the disposal facility and analytical laboratory along with the testing requirements to the Engineer not less than 5 days prior to the start of removal of yellow thermoplastic traffic stripe. The analytical laboratory shall be certified by the Department of Health Services Environmental Laboratory Accreditation Program. Test results shall be provided to the Engineer for review prior to signing a waste profile as requested by the disposal facility, prior to issuing an EPA identification number, and prior to allowing removal of the waste from the site.

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling removed yellow thermoplastic residue. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific Cal-OSHA requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Plan shall be submitted to the Engineer at least 7 days prior to beginning removal of yellow thermoplastic.

Prior to removing yellow thermoplastic traffic stripe personnel who have no prior training, including State personnel, shall complete a safety training program provided by the Contractor that meets the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead," and the Contractor's Lead Compliance Program.

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to State personnel by the Contractor. The number of State personnel will be 3.

Where grinding or other methods approved by the Engineer are used to remove yellow thermoplastic traffic stripe, the removed residue, including dust, shall be contained and collected immediately. Sweeping equipment shall not be used. Collection shall be by a high efficiency particulate air (HEPA) filter equipped vacuum attachment operated concurrently with the removal operations or other equally effective methods approved by the Engineer. The Contractor shall submit a written work plan for the removal, storage, and disposal of yellow thermoplastic traffic stripe to the Engineer for approval not less than 15 days prior to the start of the removal operations. Removal operations shall not be started until the Engineer has approved the work plan.

The removed yellow thermoplastic traffic stripe residue shall be stored and labeled in covered containers. Labels shall conform to the provisions of Title 22, California Code of Regulations, Sections 66262.31 and 66262.32. Labels shall be marked with date when the waste is generated, the words "Hazardous Waste", composition and physical state of the waste (for example, asphalt grindings with thermoplastic or paint), the word "Toxic", the name and address of the Engineer, the Engineer's telephone number, contract number, and Contractor or subcontractor. The containers shall be a type approved by the United States Department of Transportation for the transportation and temporary storage of the removed residue. The containers shall be handled so that no spillage will occur. The containers shall be stored in a secured enclosure at a location within the project limits until disposal, as approved by the Engineer.

If the yellow thermoplastic traffic stripe residue is transported to a Class 1 disposal facility, a manifest shall be used, and the transporter shall be registered with the California Department of Toxic Substance Control. The Engineer will obtain the

United States Environmental Protection Agency Identification Number and sign all manifests as the generator within 2 working days of receiving sample test results and approving the test methods.

Nothing in these special provisions shall relieve the Contractor of the Contractor's responsibilities as specified in Section 7-1.09, "Public Safety," of the Standard Specifications.

Attention is directed to "Material Containing Aerially Deposited Lead" of these special provisions regarding payment for the Lead Compliance Plan.

Full compensation for providing a written work plan for the removal, storage, and disposal of yellow thermoplastic traffic stripe shall be considered as included in the contract item paid per meter for remove yellow thermoplastic traffic stripe and no separate payment will be made therefor.

REMOVE PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

REMOVE DRAINAGE FACILITY

Existing inlets and pipes where any portion of these structures is within one meter of the grading plane in excavation areas, or within 0.3-m of original ground in embankment areas, or where shown on the plans to be removed, shall be completely removed and disposed of.

REMOVE ROADSIDE SIGN

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

RELOCATE GATE

Existing gates shall be removed and relocated to the new locations shown on the plans.

Each gate shall be installed at the new location on the same day that the gate is removed from its original location.

RELOCATE ROADSIDE SIGN

Existing roadside signs shall be removed and relocated to the new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

OBLITERATE SURFACING

Existing surfacing, when no longer required for the passage of public traffic, shall be obliterated at the locations shown on the plans.

ADJUST INLET

Existing pipe inlets and concrete drainage inlet shall be adjusted as shown on the plans.

Portland cement concrete shall be minor concrete or may be produced from commercial quality concrete containing not less than 350 kilograms of cement per cubic meter.

Adjustment of inlets shall be performed prior to paving and shall be limited to the area to be paved or surfaced during the working day in which the adjustment is performed. The top of the inlet grate or cover shall be protected from the asphalt concrete during paving operations by means of heavy plywood covers, steel plate covers or by other methods approved by the Engineer. Excess paving material shall be removed prior to rolling.

COLD PLANE ASPHALT CONCRETE PAVEMENT

Existing asphalt concrete pavement shall be cold planed at the locations and to the dimensions shown on the plans.

Planing asphalt concrete pavement shall be performed by the cold planing method. Planing of the asphalt concrete pavement shall not be done by the heater planing method.

Cold planing machines shall be equipped with a cutter head not less than 750 mm in width and shall be operated so that no fumes or smoke will be produced. The cold planing machine shall plane the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width, and shape of the cut shall be as shown on the typical cross sections or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the typical cross sections. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place.

Planed widths of pavement shall be continuous except for intersections at cross streets where the planing shall be carried around the corners and through the conform lines. Following planing operations, a drop-off of more than 45 mm will not be allowed between adjacent lanes open to public traffic.

Where transverse joints are planed in the pavement at conform lines no drop-off shall remain between the existing pavement and the planed area when the pavement is opened to public traffic. If asphalt concrete has not been placed to the level of existing pavement before the pavement is to be opened to public traffic a temporary asphalt concrete taper shall be constructed. Asphalt concrete for temporary tapers shall be placed to the level of the existing pavement and tapered on a slope of 1:30 (Vertical: Horizontal) or flatter to the level of the planed area.

Asphalt concrete for temporary tapers shall be commercial quality and may be spread and compacted by any method that will produce a smooth riding surface. Temporary asphalt concrete tapers shall be completely removed, including the removal of loose material from the underlying surface, before placing the permanent surfacing. The removed material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Operations shall be scheduled so that not more than 7 days shall elapse between the time when transverse joints are planed in the pavement at the conform lines and the permanent surfacing is placed at the conform lines.

The material planed from the roadway surface, including material deposited in existing gutters or on the adjacent traveled way, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Removal operations of cold planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

Cold plane asphalt concrete pavement will be measured by the square meter. The quantity to be paid for will be the actual area of surface cold planed irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for cold plane asphalt concrete pavement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including furnishing the asphalt concrete for and constructing, maintaining, removing, and disposing of temporary asphalt concrete tapers, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

REMOVE CONCRETE

Concrete, where shown on the plans to be removed, shall be removed.

The pay quantities of concrete curb and sidewalk to be removed will be measured by the cubic meter, measured before and during removal operations.

Removing concrete curb will be measured by the meter, measured along the curb before removal operations.

Remove concrete island (portion) will be measured by the square meter, measured before and during removal operations, of actual surface removed.

Concrete removed shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where no joint exists between concrete to be removed and concrete to remain in place, the concrete shall be cut on a neat line to a minimum depth of 50 mm with a power driven saw before the concrete is removed.

Where concrete has been removed outside the roadway prism, the backfilled areas shall be graded to drain and blend in with the surrounding terrain.

Concrete to be removed which has portions of the same structure both above and below ground will be considered as concrete above ground for compensation.

10-1.23 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 1.5 m outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor's operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor's responsibility for final cleanup of the highway as provided in Section 4-1.02, "Final Cleaning Up," of the Standard Specifications.

Vegetable growth from clearing and grubbing operations may be disposed of in embankments in conformance with the provisions in "Earthwork" of these special provisions.

REMOVE TREES

Existing trees, where shown on the plans to be removed, shall be removed in accordance with the requirements of Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Trees shall be removed to a depth of 0.3-m below finished grade. The voids shall be backfilled and compacted.

Removed trees shall be disposed of outside the highway right of way as provided in Section 7-1.13, "Disposal of Material Outside the Highway right of Way," of the Standard Specification.

Quantities of trees removed will be determined as units from actual count.

The contract unit price paid for remove tree shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing and disposing of existing trees, including backfilling and compacting voids, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.24 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Attention is directed to "Material Containing Aerially Deposited Lead" of these special provisions.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

The portion of imported borrow placed within 1.5 m of the finished grade shall have a Resistance (R-Value) of not less than 15.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic meter for the types of excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

Imported borrow shall be mineral material including rock, sand, gravel, or earth. The Contractor shall not use man-made refuse in imported borrow including:

- A. Portland cement concrete,
- B. Asphalt concrete,
- C. Material planed from roadway surfaces,
- D. Residue from grooving or grinding operations,
- E. Metal,
- F. Rubber,
- G. Mixed debris,
- H. Rubble

10-1.25 MATERIAL CONTAINING AERIALLY DEPOSITED LEAD (Area 1)

Earthwork involving material containing aerially deposited lead shall conform to the provisions in Section 19, "Earthwork" of the Standard Specifications and these special provisions.

Attention is directed to "Aerially Deposited Lead" of these special provisions.

LEAD COMPLIANCE PLAN

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling material containing aerially deposited lead. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific California Department of Industrial Relations, Division of Occupational Safety and Health (Cal-OSHA) requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The plan shall be submitted to the Engineer for review and acceptance at least ___ days prior to beginning work in areas containing aerially deposited lead.

The Contractor shall not work in areas containing aerially deposited lead within the project limits, unless authorized in writing by the Engineer, until the Engineer has accepted the Lead Compliance Plan.

Prior to performing work in areas containing aerially deposited lead, personnel who have no prior training or are not current in their training status, including Department personnel, shall complete a safety training program provided by the Contractor. The safety training program shall meet the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead."

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to Department personnel by the Contractor. The number of Department personnel will be 5.

The Engineer will notify the Contractor of acceptance or rejection of the submitted or revised Lead Compliance Plan not more than 10 days after submittal of the plan.

The contract lump sum price paid for Lead Compliance Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Lead Compliance Plan, including paying the Certified Industrial Hygienist, and for providing personal protective equipment, training and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.26 MATERIAL CONTAINING AERIALLY DEPOSITED LEAD (Area 2)

Earthwork involving material containing aerially deposited lead shall conform to the provisions in Section 19, "Earthwork" of the Standard Specifications and these special provisions.

Attention is directed to "Aerially Deposited Lead" of these special provisions.

Type Z-2 material contains aerially deposited lead in average concentrations (using the 95 percent Upper Confidence Limit) greater than or equal to 1000 mg/kg total lead; greater than or equal to 5.0 mg/L soluble lead (as tested using the California Waste Extraction Test) and the material is surplus; or greater than 3397 mg/kg total lead. Type Z-2 material exists within Area 2 of the project location and from a depth of 0 m to 0.3 m below existing grade, or as shown on the plans. This material is hazardous waste regulated by the State of California and shall be transported to and disposed of at a Class I Disposal Site. Material excavated from these areas shall be transported by a hazardous waste transporter registered with the DTSC using the required procedures for creating a manifest for the material. The vehicles used to transport the hazardous material shall conform to the current certifications of compliance of the DTSC.

LEAD COMPLIANCE PLAN

The Contractor shall prepare a project specific Lead Compliance Plan to prevent or minimize worker exposure to lead while handling material containing aerially deposited lead. Attention is directed to Title 8, California Code of Regulations, Section 1532.1, "Lead," for specific California Department of Industrial Relations, Division of Occupational Safety and Health (Cal-OSHA) requirements when working with lead.

The Lead Compliance Plan shall contain the elements listed in Title 8, California Code of Regulations, Section 1532.1(e)(2)(B). Before submission to the Engineer, the Lead Compliance Plan shall be approved by an Industrial Hygienist certified in Comprehensive Practice by the American Board of Industrial Hygiene. The plan shall be submitted to the Engineer for review and acceptance at least 15 days prior to beginning work in areas containing aerially deposited lead.

The Contractor shall not work in areas containing aerially deposited lead within the project limits, unless authorized in writing by the Engineer, until the Engineer has accepted the Lead Compliance Plan.

Prior to performing work in areas containing aerially deposited lead, personnel who have no prior training or are not current in their training status, including Department personnel, shall complete a safety training program provided by the Contractor. The safety training program shall meet the requirements of Title 8, California Code of Regulations, Section 1532.1, "Lead."

Personal protective equipment, training, and washing facilities required by the Contractor's Lead Compliance Plan shall be supplied to Department personnel by the Contractor. The number of Department personnel will be 3.

The Engineer will notify the Contractor of acceptance or rejection of the submitted or revised Lead Compliance Plan not more than 10 days after submittal of the plan.

The contract lump sum price paid for Lead Compliance Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing the Lead Compliance Plan, including paying the Certified Industrial Hygienist, and for providing personal protective equipment, training and medical surveillance, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

EXCAVATION AND TRANSPORTATION PLAN

Within 15 days after approval of the contract, the Contractor shall submit 3 copies of an Excavation and Transportation Plan to the Engineer. The Engineer will have 15 days to review the plan. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the plan within 7 days of receipt of the Engineer's comments. The Engineer will have 7 days to review the revisions. Upon the Engineer's approval of the plan, 3 additional copies incorporating the required changes shall be submitted to the Engineer. Minor changes to or clarifications of the initial submittal may be made and attached as amendments to the Excavation and Transportation Plan. In order to allow

construction to proceed, the Engineer may conditionally approve the plan while minor revisions or amendments are being completed.

The Contractor shall prepare the written, project specific Excavation and Transportation Plan establishing the procedures the Contractor will use to comply with requirements for excavating, stockpiling, transporting, and placing (or disposing) of material containing aerially deposited lead. The plan shall conform to the regulations of the DTSC and Cal-OSHA. The sampling and analysis portions of the Excavation and Transportation Plan shall meet the requirements for the design and development of the sampling plan, statistical analysis, and reporting of test results contained in USEPA, SW 846, "Test Methods for Evaluating Solid Waste," Volume II: Field Manual Physical/Chemical, Chapter Nine, Section 9.1. The plan shall contain, but not be limited to the following elements:

- A. Excavation schedule (by location and date),
- B. Temporary locations of stockpiled material,
- C. Sampling and analysis plans for areas after removal of a stockpile,
 - 1. Location and number of samples,
 - 2. Analytical laboratory,
- D. Sampling and analysis plan for post excavation from Station ____ to Station ____ as shown on the plans,
- E. Dust control measures,
- F. Transportation equipment and routes,
- G. Method for preventing spills and tracking material onto public roads,
- H. Site for disposal of hazardous waste,
- I. Spill Contingency Plan for material containing aerially deposited lead.

DUST CONTROL

Excavation, transportation, placement, and handling of material containing aerially deposited lead shall result in no visible dust migration. The Contractor shall have a water truck or tank on the job site at all times while clearing and grubbing and performing earthwork operations in work areas containing aerially deposited lead.

STOCKPILING

Stockpiles of material containing aerially deposited lead shall not be placed where affected by surface run-on or run-off. Stockpiles shall be covered with plastic sheeting 0.33 mm minimum thickness or 0.3 m of non-hazardous material. Stockpiles shall not be placed in environmentally sensitive areas. Stockpiled material shall not enter storm drains, inlets, or waters of the State.

MATERIAL TRANSPORTATION

Prior to traveling on public roads, loose and extraneous material shall be removed from surfaces outside the cargo areas of the transporting vehicles and the cargo shall be covered with tarpaulins or other cover, as outlined in the approved Excavation and Transportation Plan. The Contractor shall be responsible for costs due to spillage of material containing lead during transport.

The Department will not consider the Contractor a generator of the hazardous material, and the Contractor will not be obligated for further cleanup, removal, or remedial action for such material handled or disposed of in conformance with the requirements specified in these special provisions and the appropriate State and Federal laws and regulations and county and municipal ordinances and regulations regarding hazardous waste.

DISPOSAL

Materials containing aerially deposited lead shall be disposed of within California. The disposal site shall be operating under a permit issued by the appropriate California Environmental Protection Agency board or department.

The Engineer will obtain the Environmental Protection Agency Generator Identification Number for hazardous waste disposal. The Engineer will sign all hazardous waste manifests. The Contractor shall notify the Engineer 5 days before the manifests are to be signed.

Sampling, analyzing, transporting, and disposing of material containing aerially deposited lead excavated outside the pay limits of excavation will be at the Contractor's expense.

MEASUREMENT AND PAYMENT

Quantities of roadway excavation (aerially deposited lead) and structure excavation (aerially deposited lead), of the types shown in the Engineer's Estimate, will be measured and paid for in the same manner specified for roadway excavation and structure excavation, respectively, in Section 19, "Earthwork," of the Standard Specifications.

Full compensation for preparing an approved Excavation and Transportation Plan, transporting material containing aerially deposited lead reused in the work from location to location, and transporting and disposing of material containing aerially deposited lead shall be considered as included in the contract prices paid per cubic meter for the items of roadway excavation (aerially deposited lead) and structure excavation (aerially deposited lead) of the types involved, and no additional compensation will be allowed therefor.

No payment for stockpiling of material containing aerially deposited lead will be made, unless the stockpiling is ordered by the Engineer.

Sampling, analyses, and reporting of results for surplus material not previously sampled will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.27 SITE

Health and Safety Plan

The Contractor shall prepare a detailed Site Health and Safety Plan for all site personnel, that identifies potential health and safety hazards associated with each operation and specifies work practices that will be used to protect workers from those hazards in conformance with the DTSC and CAL-OSHA regulations. At a minimum, the Site Health and Safety Plan shall identify key site safety personnel, describe risks associated with the work, describe training requirements, describe appropriate personal protective equipment, describe any site-specific medical surveillance requirements, describe any periodic air monitoring requirements, define appropriate site work zones, and describe any decontamination requirements. The Health and Safety Plan shall be submitted at least 15 working days prior to beginning work for review and acceptance by the Engineer. Prior to submittal, the Contractor shall have the Site Health and Safety Plan approved by an Industrial Hygienist certified in comprehensive practice by the American Board of Industrial Hygiene. Subcontractors shall use the Site Health and Safety Plan prepared by the Contractor or prepare and submit a separate Site Health and Safety Plan in conformance with these special provisions.

SAFETY. --Prior to performing work at the locations containing material classified as restricted, all personnel, including State Personnel, shall complete a safety training program that communicates the potential health and safety hazards associated with work on the site and instructs the personnel in procedures for doing the work safely. The level of training provided shall be consistent with the person's job function and conforms to OSHA and CAL-OSHA regulations. The training, including subsequent training required until the completion of the work, shall be provided by the Contractor. The Contractor shall provide a certification of completion of the Safety Training Program to all personnel. Any personal protective equipment required by the Contractor's Health & Safety Plan for personnel working within the exclusion zone will be supplied to State personnel by the Contractor. The number of State personnel requiring the above mentioned safety training program and personal protective equipment will be 5.

The decontamination area shall be located outside of the exclusion zone. Water from decontamination procedures shall be collected and disposed of at an appropriate disposal site by the Contractor. Non-reusable protective equipment, once used by any personnel, including State personnel, shall be collected and disposed of at an appropriate disposal site by the Contractor. The Contractor shall implement a plan to prevent exposure of personnel working in hazardous material excavations.

The contract lump sum price paid for Site Health and Safety Plan shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all work involved in preparing and implementing the project specific Health and Safety Plan including paying the Certified Industrial Hygienist and for providing personal protective equipment, training and medical surveillance as specified in these special provisions.

10-1.28 HAZARDOUS AND RESTRICTED MATERIAL EXCAVATION

All restricted material to be excavated as shown on the table below or on the plans are within Area 3 and shall be transported to a disposal facility permitted to accept such material.

Attention is directed to "Restricted Material" elsewhere in these special provisions.

Attention is directed to the following table or to the plans that summarizes the degree and type of contamination in the areas to be excavated.

Location	Medium	Depth	EPA Analysis	Contaminant	Contaminant Level	RWQCB Industrial ESL
Area 3	Soil	0.0 to 1.0 meter	1664	Motor Oil	16 to 10,400 mg/kg	1000 mg/kg

All soil excavated at a depth of 0 to 1.0 meter below ground surface within Area 3 of the project limits is designated restricted material.

Restricted materials shall be transferred directly from the excavation to a registered transport vehicle, a storage container approved for transport of hazardous waste by the United States Department of Transportation, or a stockpile location approved by the Engineer. Stockpile locations shall be maintained in accordance with the following requirements:

The material shall be stored on undamaged 1.524 millimeters high-density polyethylene or an equivalent impermeable barrier unless the stockpiling location is on a paved surface. If the location is on a paved surface the thickness of the barrier can be reduced to 0.51-millimeter high-density polyethylene or its equivalent. The dimensions of the barrier shall exceed the dimensions of the stockpile at all times. Any seams in the barrier shall be sealed to prevent leakage.

At the end of each day the material shall be covered with undamaged 0.305-millimeter polyethylene or an equivalent impermeable barrier to prevent windblown dispersion and precipitation run-off and run-on. When more than one sheet is required to cover the material, the sheets shall be overlapped a minimum of 0.46 meter in a manner that prevents water from flowing onto the material. The cover shall be secured in a manner that keeps it in place at all times. Driven anchors shall not be used except at the perimeter of the stockpile. The cover shall be inspected and maintained in accordance with the requirements of "Water Pollution Control" of these special provisions.

These stockpiling requirements apply to all temporary storage of restricted material outside of an excavation or a transport container including, but not limited to, staging of excavated material next to the excavation prior to pick up by loading equipment, accumulating material for full transport loads, and awaiting test results required by a disposal facility. The removal of stockpiles shall begin within 30 days of accumulating 100 kg of hazardous material. After final removal has occurred the Contractor shall be responsible for any cleanup deemed necessary by the Engineer.

Quantities of roadway excavation (Type R) will be measured and paid for in the same manner specified for roadway excavation in Section 19, "Earthwork," of the Standard Specifications.

Full compensation for loading, transporting, and disposing of restricted material, furnishing, installing and removing physical barriers, shall be considered as included in the contract price paid per cubic meter for roadway excavation (Type R) and no additional compensation will be allowed therefor.

10-1.29 EROSION CONTROL (TYPE D)

Erosion control (Type D) shall conform to the provisions in Section 20-3, "Erosion Control," of the Standard Specifications and these special provisions and shall consist of applying erosion control materials to embankment and excavation slopes, erosion control (netting) areas, unlined ditches, and other areas disturbed by construction activities. Erosion control (Type D) shall be applied during the period starting September 1 and ending November 30; or, if the slope on which the erosion control is to be placed is finished during the rainy season as specified in "Water Pollution Control" of these special provisions, the erosion control shall be applied immediately, or, if the slope on which the erosion control is to be placed is finished outside both specified periods and the contract work will be completed before September 1, the erosion control shall be applied as a last item of work.

If the slope on which the erosion control is to be placed is finished during the rainy season as specified in "Water Pollution Control" of these special provisions, the erosion control shall be applied immediately to the slope. Erosion Control materials shall be applied upon completion of installation of Erosion control (netting) as described in these special provisions.

Prior to installing erosion control materials, soil surface preparation shall conform to the provisions in Section 19-2.05, "Slopes," of the Standard Specifications, except that rills and gullies exceeding 50 mm in depth or width shall be leveled. Vegetative growth, temporary erosion control materials, and other debris shall be removed from areas to receive erosion control.

MATERIALS

Materials shall conform to the provisions in Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed shall conform to the provisions in Section 20-2.10, "Seed," of the Standard Specifications. Individual seed species shall be measured and mixed in the presence of the Engineer.

Seed shall be delivered to the project site in unopened separate containers with the seed tag attached. Containers without a seed tag attached will not be accepted.

A sample of approximately 30 g of seed will be taken from each seed container by the Engineer.

Legume Seed

Legume seed shall be pellet-inoculated or industrial-inoculated and shall conform to the following:

- A. Inoculated seed shall be inoculated in conformance with the provisions in Section 20-2.10, "Seed," of the Standard Specifications.
- B. Inoculated seed shall have a calcium carbonate coating.
- C. Industrial-inoculated seed shall be inoculated with Rhizobia and coated using an industrial process by a manufacturer whose principal business is seed coating and seed inoculation.
- D. Industrial-inoculated seed shall be sown within 180 calendar days after inoculation.
- E. Legume seed shall consist of the following:

LEGUME SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Lupinus bicolor (Miniature Lupine)	40	3.0
Lupinus nanus (Sky Lupine)	40	6.0
Lotus purshianus (Purshing's Lotus)	40	3.0

Non-Legume Seed

Non-legume seed shall consist of the following:

NON-LEGUME SEED

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Eschscholzia californica (California Poppy)	35	3.0
Hordeum californicum 'prostrate' (California Barley Prostrate)	45	10.0
Festuca idahoensis "Romeri" (Idaho Fescue)	45	12.0
Vulpia microstachys (Three Weeks Fescue)	45	15.0

Straw

Straw shall be derived from rice.

Compost

At the option of the Contractor, compost may be either A, B, or any combination of both:

- A. Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products.
- B. Class A, exceptional quality biosolids composts, conforming to the requirements in United States Environmental Protection Agency (EPA) regulation 40 CFR, Part 503c.

Compost shall not contain paint, petroleum products, herbicides, fungicides or other chemical residues harmful to plant or animal life. Other deleterious material, plastic, glass, metal or rock shall not exceed 0.1-percent by weight or volume.

Compost shall be thermophilically processed for 15 days. During this process, the compost shall be maintained at minimum internal temperature of 55°C and be thoroughly turned at least 5 times. A 90-day curing period shall follow the thermophilic process.

Compost shall be screened through a screen no larger than 12 mm.

Compost shall measure at least 6 on the maturity and stability scale with a Solvita test kit.

A Certificate of Compliance for compost shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall state the Solvita maturity and stability scale test result of the compost.

Stabilizing Emulsion

Stabilizing emulsion shall conform to the provisions in Section 20-2.11, "Stabilizing Emulsion," of the Standard Specifications and these special provisions.

Stabilizing emulsion shall be in a dry powder form, may be reemulsifiable, and shall be a processed organic adhesive derivative *Plantago ovata* used as a soil tackifier.

APPLICATION

Erosion control materials shall be applied in separate applications in the following sequence:

- A. The following mixture in the rates indicated shall be applied with hydro-seeding equipment within 60 minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Legume Seed	12
Non-Legume Seed	40
Fiber	320

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	2

- B. The following mixture in the rates indicated shall be applied with hydro-seeding equipment:

Material	Kilograms Per Hectare (Slope Measurement)
Fiber	320
Stabilizing Emulsion (Solids)	140

Material	Cubic Meter Per Hectare (Slope Measurement)
Compost	2

Hydroseeding, for all Erosion control (netting) areas shall be applied by hose, from the ground. Erosion control (Type D) materials shall be applied at close range onto the unlined ditch face such that the materials are well integrated into the erosion control (netting) and in close contact with ground surface. Application shall be perpendicular to the unlined ditch face such that erosion control (netting) materials are not damaged or displaced. Any erosion control (netting) materials that are damaged or displaced shall immediately be repaired by the Contractor at the Contractor's expense.

The ratio of total water to total stabilizing emulsion in the mixture shall be as recommended by the manufacturer.

The rates of erosion control materials may be changed by the Engineer to meet field conditions.

MEASUREMENT AND PAYMENT

Compost (erosion control) will be measured by the cubic meter in the vehicle at the point of delivery in conformance with the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

The contract price paid per cubic meter for compost (erosion control) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying compost for erosion control, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.30 FIBER ROLLS

Fiber rolls shall conform to the details shown on the plans and these special provisions.

MATERIALS

Fiber rolls shall consist of one of the following:

- A. Fiber rolls shall be constructed with manufactured blankets consisting of one material or a combination of materials consisting of wood excelsior, rice or wheat straw, or coconut fibers. Blankets shall measure approximately 2.0 to 2.4 m wide by 20 m to 29 m in length. Wood excelsior material shall have individual fibers, 80 percent of which shall be 150 mm or longer in fiber length. Blankets shall have a photodegradable plastic netting or biodegradeable jute, sisal or coir fiber netting on at least one side. The blanket shall be rolled on the blanket's width and secured with jute twine spaced 2 m apart along the roll for the full length and 150 mm from each end of the individual rolls. The finished roll diameter shall be a minimum of 200 mm and a maximum of 250 mm and shall weigh not less than 0.81 kg/m. Overlapping of more than one blanket may be required to achieve the finished roll diameter. When overlapping is required, blankets shall be longitudinally overlapped 150 mm along the length of the fabric.
- B. Fiber rolls shall be pre-manufactured rice or wheat straw, wood excelsior or coconut fiber rolls encapsulated within a photodegradable plastic or biodegradeable jute, sisal or coir fiber netting. Each roll shall be a minimum of 200 mm and a maximum of 250 mm in diameter, 3 m to 6 m in length and shall weigh not less than 1.6 kg/m. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the individual rolls.
The finished roll diameter for coir roll as shown on the plans shall be 508mm.
- C. Stakes shall be fir or pine and shall be a minimum of 19 mm x 38 mm x 450 mm in length. The Contractor shall submit a sample of the metal stake to the Engineer prior to installation.

Rope Restraint for securing fiber rolls shall be a 12mm diameter braided hemp twine.

INSTALLATION

Fiber rolls shall be joined tightly together to form a single linear roll that is installed approximately parallel to the slope contour and as shown on the plans.

Fiber rolls installed on erosion control (netting) shall be overlapped at the ends as shown on the plans. Fiber rolls shall be installed prior to the application of other erosion control materials.

Furrows shall be constructed at a slight angle to the slope contour-to a depth of 50 mm to 100 mm, and at a sufficient width to hold the fiber rolls. The bedding area for the fiber roll shall be cleared of obstructions including, but not limited to rocks, clods and debris greater than 25 mm in diameter prior to installation. Fiber rolls shall be installed as shown on the plans.

Stakes shall be installed 600 mm apart along the total length of the rolls and 125 mm from the end of each individual roll. Stakes shall be driven flush or a maximum of 50 mm above the roll.

Fiber rolls installed on erosion control netting and coir rolls shall be installed as shown on the plans. A rope restraint shall be used to lash and anchor the fiber and coir rolls. Following tight lashing of the rolls to secure them in place, the wooden stakes shall be driven again into the ground to remove any slack in the restraint.

MEASUREMENT AND PAYMENT

Fiber rolls will be measured by the meter from end to end along the centerline of the installed rolls. Coir roll shall be measured as a fiber roll.

The contract price paid per meter for fiber rolls shall include full compensation for furnishing all labor, materials (including coir rolls), tools, equipment, and incidentals, and for doing all the work involved in installing fiber and coir rolls, complete in place, including stakes and restraints, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.31 IRRIGATION CROSSOVERS

Irrigation crossovers shall conform to the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications and these special provisions.

Conduits shall be placed in open trenches in conformance with the provisions in Section 20-5.03B, "Conduit for Irrigation Crossovers," of the Standard Specifications.

Conduits shall be corrugated high density polyethylene (CHDPE) pipe. Corrugated high density polyethylene pipe shall conform to the requirements in ASTM Designation: F 405 or F 667, or AASHTO Designation: M 252 or M 294 and shall be Type S. Couplings and fittings shall be as recommended by the pipe manufacturer.

Water line crossovers shall conform to the provisions in Section 20-5.03C, "Water Line Crossovers," of the Standard Specifications.

Sprinkler control crossovers shall conform to the provisions in Section 20-5.027D, "Sprinkler Control Crossovers," of the Standard Specifications.

Installation of pull boxes shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduit and Pull Boxes," of the Standard Specifications. When no conductors are installed in electrical conduits, pull boxes for irrigation crossovers shall be installed on a foundation of compacted soil.

10-1.32 ASPHALT CONCRETE

Asphalt concrete shall be Type A and shall conform to the provisions in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

The amount of asphalt binder used in asphalt concrete placed in dikes, gutters, gutter flares, overside drains and aprons at the ends of drainage structures shall be increased one percent by mass of the aggregate over the amount of asphalt binder determined for use in asphalt concrete placed on the traveled way.

The aggregate for Type A asphalt concrete shall conform to the 2.5-mm Maximum, Medium grading specified in Section 39-2.02, "Aggregate," of the Standard Specifications.

The asphalt content of the asphalt mixture will be determined in conformance with the requirements in California Test 379, or in conformance with the requirements in California Test 382.

Paint binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer.

Paint binder (tack coat) shall be, at the option of the Contractor, either slow-setting asphaltic emulsion, rapid-setting asphaltic emulsion or paving asphalt. Slow-setting asphaltic emulsion and rapid-setting asphaltic emulsion shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 94, "Asphaltic Emulsions," of the Standard Specifications. When paving asphalt is used for paint binder, the grade will be determined by the Engineer. Paving asphalt shall conform to the provisions in Section 39-4.02, "Prime Coat and Paint Binder (Tack Coat)," and the provisions in Section 92, "Asphalts," of the Standard Specifications.

Paint binder (tack coat) shall be applied in the liter per square meter range limits specified for the surfaces to receive asphalt concrete in the tables below. The exact application rate within the range will be determined by the Engineer.

Application Rates for Asphaltic Emulsion Paint Binder (Tack Coat) on Asphalt Concrete (except Open Graded) and on Portland Cement Concrete Pavement (PCCP)		
Type of surface to receive paint binder (tack coat)	Slow-Setting Asphaltic Emulsion L/m ² (Note A)	Rapid-Setting Asphaltic Emulsion L/m ² (Note B)
Dense, compact surfaces, between layers, and on PCCP	0.20 – 0.35	0.10 – 0.20
Open textured, or dry, aged surfaces	0.35 – 0.90	0.20 – 0.40

Note A: Slow-setting asphaltic emulsion is asphaltic emulsion diluted with additional water. Water shall be added and mixed with the asphaltic emulsion (containing up to 43 percent water) so the resulting mixture contains one part asphaltic emulsion and not more than one part added water. The water shall be added by the emulsion producer or at a facility that has the capability to mix or agitate the combined blend.

Note B: Undiluted rapid-setting asphaltic emulsion.

Application Rates for Paint Binder (Tack Coat) on Asphalt Concrete (except Open Graded) and on Portland Cement Concrete Pavement (PCCP)	
Type of surface to receive paint binder (tack coat)	Paving Asphalt L/m ²
Dense, compact surfaces, between layers, and on PCCP	0.05 – 0.10
Open textured, or dry, aged surfaces	0.10 – 0.25

When asphaltic emulsion is used as paint binder (tack coat), asphalt concrete shall not be placed until the applied asphaltic emulsion has completely changed color from brown to black.

10-1.33 PILING

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

Unless otherwise specified, welding of any work performed in conformance with the provisions in Section 49, "Piling," of the Standard Specifications, shall be in conformance with the requirements in AWS D1.1.

Attention is directed to "Precast Concrete Quality Control" of these special provisions.

Attention is directed to "Welding" of these special provisions.

Difficult pile installation is anticipated due to the presence of soft bay mud overlying dense soils, caving soils, hazardous and contaminated materials, serpentine materials, tidal flow fluctuation, high ground water, cobbles and boulders, subsurface concrete debris, low overhead clearance, underground utilities, overhead utilities, the requirements of pile embedment into rock, sound control, vibration monitoring and traffic control.

MEASUREMENT AND PAYMENT (PILING)

Measurement and payment for the various types and classes of piles shall conform to the provisions in Sections 49-6.01, "Measurement," and 49-6.02, "Payment," of the Standard Specifications.

10-1.34 CONCRETE STRUCTURES

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications.

10-1.35 SEALING JOINTS

Joints between concrete structures shall be sealed in conformance with the details shown on the plans, and in conformance with the provisions in Section 51, "Concrete Structures," of the Standard Specifications.

When ordered by the Engineer, a joint seal larger than called for by the Movement Rating shown on the plans shall be furnished and installed. Payment to the Contractor for furnishing the larger seal and for saw cutting the increment of additional depth of groove required will be determined as provided in Section 4-1.03, "Changes," of the Standard Specifications.

10-1.36 ARCHITECTURAL SURFACE (TEXTURED CONCRETE)

Architectural textures for concrete surfaces of retaining wall shall conform to the details shown on the plans and the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions:

Architectural texture listed below are required at concrete surfaces shown on the plans:

A. Formed relief texture

The architectural texture shall simulate a formed relief constructed to the dimensions and shapes shown on the plans. Corners at the intersection of plane surfaces shall be sharp and crisp without easing or rounding. A Class 1 surface finish shall be applied to the architectural texture.

REFEREE SAMPLE

The architectural texture shall match the texture, color and pattern of the referee sample located at Caltrans, 111 Grand Ave. Oakland, California 94612; Office of Landscape Architecture; 9th Floor available for inspection by bidders .

TEST PANEL

A test panel at least 1.25 m x 1.25 m in size shall be successfully completed at a location approved by the Engineer before beginning work on architectural textures. The test panel shall be constructed and finished with the materials, tools, equipment and methods to be used in constructing the architectural texture. If ordered by the Engineer, additional test panels shall be constructed and finished until the specified finish, texture and color are obtained, as determined by the Engineer.

The test panel approved by the Engineer shall be used as the standard of comparison in determining acceptability of architectural texture for concrete-surfaces.

FORM LINERS

Form liners shall be used for textured concrete surfaces and shall be installed in conformance with the manufacturer's recommendations, unless other methods of forming textured concrete surfaces are approved by the Engineer. Form liners shall be manufactured from an elastomeric material or a semi-elastomeric polyurethane material by a manufacturer of commercially available concrete form liners. No substitution of other types of formliner material will be allowed. Form liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating, recognizable shadow patterns shall be prevented by proper casting of form liner patterns. Textured concrete surfaces with such recurring textural configurations shall be reworked to remove such patterns as approved by the Engineer or the concrete shall be replaced.

Form liners shall have the following properties:

Description	ASTM Designation:	Range
Elastomeric material		
Shore A hardness	D 2240	20 to 65
Tensile strength (MPa)	D 412	0.9 to 6.2
Semi-elastomeric polyurethane		
Shore D hardness	D 2240	55 to 65
Tensile strength (MPa)	D 2370	18 minimum

Cuts and tears in form liners shall be sealed and repaired in conformance with the manufacturer's recommendations. Form liners that are delaminated from the form shall not be used. Form liners with deformations to the manufactured surface caused by improper storage practices or any other reason shall not be used.

Form liners shall extend the full length of texturing with transverse joints at 2.5 m minimum spacing. Small pieces of form liners shall not be used. Grooves shall be aligned straight and true. Grooves shall match at joints between form liners. Joints in the direction of grooves in grooved patterns shall be located only in the depressed portion of the textured concrete. Adjoining liners shall be butted together without distortion, open cracks or offsets at the joints. Joints between liners shall be cleaned before each use to remove any mortar in the joint.

Adhesives shall be compatible with the form liner material and with concrete. Adhesives shall be approved by the liner manufacturer. Adhesives shall not cause swelling of the liner material.

RELEASING FORM LINERS

Products and application procedures for form release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the liner material or delamination from the forms. Release agents shall not stain the concrete or react with the liner material. For reliefs simulating fractured concrete or wood grain surfaces the application method shall include the scrubbing method using a natural bristle scrub brush in the direction of grooves or grain. The release agent shall coat the liner with a thin film. Following application of form release agent, the liner surfaces shall be cleaned of excess amounts of agent using compressed air. Buildup of form release agent caused by the reuse of a liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of liner material on the concrete and without pulling or breaking concrete from the textured surface. The concrete surfaces exposed by removing forms shall be protected from damage.

CURING

Concrete surfaces with architectural texture shall be cured only by the forms-in-place or water methods. Seals and curing compounds shall not be used.

PAYMENT

Full compensation for architectural texture shall be considered as included in the contract price paid per cubic meter for Structural Concrete, Retaining Wall and no separate payment will be made therefor.

10-1.37 REINFORCEMENT

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The Department's mechanical splices prequalified list can be found at the following internet site:

http://www.dot.ca.gov/hq/esc/approved_products_list/

The provisions of "Welding Quality Control" of these special provisions shall not apply to resistance butt welding.

10-1.38 ROADSIDE SIGNS

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWPA Use Category System: UC4A, Commodity Specification A or B.

10-1.39 FURNISH SIGN

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign codes are available for review at the Department's internet site:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Traffic Sign Specifications for signs referenced with Federal MUTCD sign codes can be found in Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at the following Internet website:

<http://mutcd.fhwa.dot.gov/ser-pubs.htm>

Information on cross-referencing California sign codes with the Federal MUTCD sign codes is available at the Department's internet site:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 8 m. The face of each finished sign shall be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

SHEET ALUMINUM

Alloy and temper designations for sheet aluminum shall be in accordance with ASTM Designation: B209.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B449. Surface of the sheet aluminum shall be cleaned, deoxidized, and coated with a light and tightly adherent chromate conversion coating free of powdery residue. The conversion coating shall be Class 2 with a mass between 108 mg/m² and 377 mg/m², and an average mass of 269 mg/m². Following the cleaning and coating process, the sheet aluminum shall be protected from exposure to grease, oils, dust, and contaminants.

Sheet aluminum shall be free of buckles, warps, dents, cockles, burrs, and defects resulting from fabrication.

Base plate for standard route marker shall be die cut.

RETROREFLECTIVE SHEETING

The Contractor shall furnish retroreflective sheeting for sign background and legend in accordance with ASTM Designation: D4956 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Retroreflective sheeting shall be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, and damage.

Class 1, 3, or 4 adhesive backing shall be used for Type II, III, IV, VII, VIII, and IX retroreflective sheeting. Class 2 adhesive backing may also be used for Type II retroreflective sheeting. The adhesive backing shall be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the Engineer's visual test will govern.

PROCESS COLOR AND FILM

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D4956 are in dispute, the Engineer's visual test will govern.

The Contractor shall provide patterns, layouts, and set-ups necessary for the screened process.

The Contractor may use green, red, blue, and brown reverse-screened process colors for background and non-reflective opaque black film or black screened process color for legend. The coefficient of retroreflection for reverse-screened process colors on white retroreflective sheeting shall not be less than 70 percent of the coefficient of retroreflection specified in ASTM Designation: D4956.

The screened process colors and non-reflective opaque black film shall have the same outdoor weatherability as that of the retroreflective sheeting.

After curing, screened process colors shall withstand removal when tested by applying 3M Company Scotch Brand Cellophane Tape No. 600 or equivalent tape over the color and removing with one quick motion at 90° angle.

SINGLE SHEET ALUMINUM SIGN

Single Sheet aluminum signs shall be fabricated and furnished with or without frame. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions. Single sheet aluminum signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38.

Single Sheet aluminum signs shall not have a vertical splice in the sheet aluminum. For signs with depth greater than 1220 mm, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum sign shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of +3 mm. The face sheet shall be affixed to the frame with rivets of 5-mm diameter. Rivets shall be placed within the web of channels and shall not be placed less than 13 mm from edges of the sign panels. Rivets shall be made of aluminum alloy 5052 and shall be anodized or treated with conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

Finished signs shall be flat within a tolerance of +3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within +3 mm of the detailed dimensions.

Aluminum channels or rectangular aluminum tubings shall be welded together with the inert gas shielded-arc welding process using E4043 aluminum electrode filler wires as shown on the plans. Width of the filler shall be equal to wall thickness of smallest welded channel or tubing.

FIBERGLASS REINFORCED PLASTIC PANEL SIGN

The Contractor shall furnish fiberglass reinforced plastic panel sign in accordance with ASTM Designation: D3841 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Fiberglass reinforced plastic shall be acrylic modified and ultraviolet stabilized for outdoor weatherability. The plastic shall contain additives designed to suppress fire ignition and flame propagation. When tested in accordance with the requirements in the ASTM Designation: D635, the extent of burning shall not exceed 25 mm.

Fiberglass reinforced plastic shall be stabilized to prevent the release solvents and monomers. The front and back surfaces of the laminate shall be clean and free of constituents and releasing agents that can interfere with the bonding of retroreflective sheeting.

The fiberglass reinforced plastic panel sign shall be weather resistant Grade II thermoset polyester laminate.

The fiberglass reinforced plastic panels shall be minimum 3.4 mm thick. Finished fiberglass reinforced plastic panel signs shall be flat within a tolerance of +3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within +3 mm of the specified dimensions.

Color of fiberglass reinforced plastic panels shall be uniform gray within Munsell range of N7.5 to N8.5.

Fiberglass reinforced plastic panels shall be cut from a single piece of laminate. Bolt holes shall be predrilled. The predrilled bolt holes, panel edges, and the front and back surfaces of the panels shall be true and smooth. The panel surfaces shall be free of visible cracks, pinholes, foreign inclusions, warping and wrinkles that can affect performance and serviceability.

10-1.40 ALTERNATIVE PIPE

Alternative pipe culverts shall conform to the provisions in Section 62, "Alternative Culverts," of the Standard Specifications and these special provisions.

Minor concrete (backfill) for alternative culverts shall be constructed in conformance with the provisions in Section 66-1.045, "Concrete Backfill," of the Standard Specifications and will be measured and paid for in conformance with the provisions in Section 66-4, "Measurement and Payment," of the Standard Specifications and the following:

- A. The quantity of concrete backfill to be paid for, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of corrugated steel pipe.

10-1.41 MISCELLANEOUS FACILITIES

Alternative flared end section shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications.

10-1.42 SLOPE PROTECTION

Slope protection shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications.

Rock slope protection fabric shall be woven or nonwoven type fabric, Type B.

10-1.43 MISCELLANEOUS CONCRETE CONSTRUCTION

Sidewalk, Curb & Gutter, Curb ramps shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps in conformance with the details shown on the plans and these special provisions. At the option of the Contractor, the detectable warning surface shall be prefabricated, cast-in-place, or stamped into the surface of the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard 595B, Color No. 33538.

Prefabricated detectable warning surface shall be in conformance with the requirements established by the Department of General Services, Division of State Architect and be attached in conformance with the manufacturer's recommendations.

Cast-in-place and stamped detectable warning surfaces shall be painted in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

The finished surfaces of the detectable warning surface shall be free from blemishes.

Prior to constructing the cast-in-place or stamping the detectable warning surface, the Contractor shall demonstrate the ability to produce a detectable warning surface conforming to the details shown on the plans and these special provisions by constructing a 600-mm by 600-mm test panel.

The manufacturer shall provide a written 5-year warranty for prefabricated detectable warning surfaces, guaranteeing replacement when there is defect in the dome shape, color fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period shall begin upon acceptance of the contract.

Full compensation for constructing or furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (miscellaneous construction) and no separate payment will be made therefor.

10-1.44 MISCELLANEOUS IRON AND STEEL

Miscellaneous iron and steel shall conform to the provisions in Section 75, "Miscellaneous Metal," of the Standard Specifications.

10-1.45 CHAIN LINK FENCE

Chain link fence shall be Type CL-1.8 as shown on the plans and shall conform to the provisions in Section 80, "Fences," of the Standard Specifications. AASHTO Designation: M 170M for the Class of pipe designated.

10-1.46 CHAIN LINK FENCE (TYPE CL-1.8, SLATTED)

Chain link fence (Type CL-1.8, slatted) consisting of chain link fence (Type CL-1.8) with wood or plastic slats inserted vertically in the chain link fabric shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

Chain link fence fabric shall be woven from 3.76 mm (9-gage) galvanized steel wire. Mesh openings in the chain link fence fabric shall be approximately 83 mm vertically and 133 mm horizontally.

Wood slats shall consist of clear redwood or light to medium weight wood produced by the species Shorea (Meranti). Wood slats shall be not less than 6 mm thick and approximately 60 mm wide with a length sufficient to fill the vertical opening of the fabric. The slats shall be inserted vertically in the mesh openings so that the slats fit snugly and shall be fastened in a manner to prevent easy removal or displacement.

Plastic slats shall be manufactured from a high density virgin polyethylene with ultraviolet inhibitors, shall be forest green in color, and shall conform to the following:

- A. Plastic slats shall have a flat tubular cross section with a wall thickness of approximately 0.8-mm; depth of approximately 8.3 mm; width of approximately 60.5 mm; and a length equal to the designated fence height.
- B. The plastic slats shall have the following material specifications:

Property	Value	ASTM Designation
Melt Index	0.24	D 1238
Density	0.951	D 1505
Low Temperature Brittleness	-60°C	D 746
Tensile Strength	25.5 MPa	D 638

10-1.47 METAL BEAM GUARD RAILING

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

Line posts shall be wood, steel, or plastic. Blocks shall be wood or plastic.

10-1.48 CONCRETE BARRIER

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications.

10-1.49 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $250 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $150 \text{ mcd} \cdot \text{m}^{-2} \cdot \text{lx}^{-1}$.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic material for traffic stripes shall be applied at a minimum rate of 0.3–kg/m. The minimum application rate is based on a solid stripe of 100 mm in width.

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

10-1.50 PAINT PAVEMENT MARKING

Painted pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Pavement marking paint shall conform to the requirements in State Specification No. PTWB-01.

The color of the pavement markings shall conform to the requirements in ASTM Designation: D 6628-01.

Retroreflectivity of the paint pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White painted pavement markings shall have a minimum initial retroreflectivity of $250 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$. Yellow painted pavement markings shall have a minimum initial retroreflectivity of $150 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

At the option of the Contractor, permanent pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of painted pavement markings. Permanent tape, if used, shall be placed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of painted pavement markings, the tape will be measured and paid for by the square meter as paint pavement marking of the number of coats designated in the Engineer's Estimate.

10-1.51 PARKING BUMPER

Parking bumpers shall be furnished and installed at the locations and in the manner shown on the plans.

Parking bumpers shall be precast concrete, reinforced as shown on the plans, and shall be constructed from commercial quality concrete containing not less than 280 kg of cement per cubic meter and reinforcing steel or shall be commercially available precast concrete bumpers conforming to the details shown on the plans. Minor variations in cross section dimensions will be acceptable in commercially available units.

Dowels shall be commercial quality reinforcing steel or mild steel rods.

Parking bumpers will be measured by the unit as determined from actual count in place.

The contract unit price paid for parking bumper (precast concrete) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing precast concrete parking bumpers, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

10-1.52 PAVEMENT MARKERS

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

SECTION 10-2 HIGHWAY PLANTING AND IRRIGATION SYSTEMS

10-2.01 GENERAL

The work performed in connection with highway planting and irrigation systems shall conform to the provisions in Section 20, "Erosion Control and Highway Planting," of the Standard Specifications and these special provisions.

When fluctuations of water pressure and water supply are encountered during normal working hours, plants shall be watered at other times, as often, and in sufficient amounts as conditions may require to keep the soil and plant roots moist during the life of the contract.

Full compensation for watering plants outside normal working hours shall be considered as included in the contract lump sum prices paid for highway planting and plant establishment work and no additional compensation will be allowed therefor.

PROGRESS INSPECTIONS

Progress inspections will be performed by the Engineer for completed highway planting and irrigation system work at designated stages during the life of the contract.

Progress inspections will not relieve the Contractor of responsibility for installation in conformance with the special provisions, plans and Standard Specifications. Work within an area shall not progress beyond each stage until the inspection has been completed, corrective work has been performed, and the work is approved, unless otherwise permitted by the Engineer.

The requirements for progress inspections will not preclude additional inspections of work by the Engineer at other times during the life of the contract.

The Contractor shall notify the Engineer, in writing, at least 4 working days prior to completion of the work for each stage of an area and shall allow a minimum of 3 working days for the inspection.

Progress inspections will be performed at the following stages of work:

- A. During pressure testing of the pipelines on the supply side of control valves.
- B. During testing of low voltage conductors.
- C. Before planting begins and after completion of the work specified for planting in Section 20-4.03, "Preparing Planting Areas," of the Standard Specifications.
- D. Before plant establishment work begins and after completion of the work specified for planting in Section 20-4.05, "Planting," of the Standard Specifications.
- E. At intervals of one month during the plant establishment period.

COST BREAK-DOWN

The Contractor shall furnish the Engineer a cost break-down for the contract lump sum items of highway planting and irrigation system. Cost break-down tables shall be submitted to the Engineer for approval within 15 working days after the contract has been approved. Cost break-down tables will be approved, in writing, by the Engineer before any partial payment will be made for the applicable items of highway planting and irrigation system involved.

Attention is directed to "Time-Related Overhead" of these special provisions regarding compensation for time-related overhead.

Cost break-downs shall be completed and furnished in the format shown in the samples of the cost break-downs included in this section. Line item descriptions of work shown in the samples are the minimum to be submitted. Additional line item descriptions of work may be designated by the Contractor. If the Contractor elects to designate additional line item descriptions of work, the quantity, value and amount for those line items shall be completed in the same manner as for the unit descriptions shown in the samples. The line items and quantities given in the samples are to show the manner of preparing the cost break-downs to be furnished by the Contractor.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and their values shall be included in the cost break-downs submitted to the Engineer for approval. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-downs submitted for approval.

The sum of the amounts for the line items of work listed in each cost break-down table for highway planting and for irrigation system work shall be equal to the contract lump sum price bid for Highway Planting and Irrigation System, respectively. Overhead and profit, except for time-related overhead, shall be included in each individual line item of work listed in a cost break-down table.

No adjustment in compensation will be made in the contract lump sum prices paid for highway planting and irrigation system due to differences between the quantities shown in the cost break-downs furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

Individual line item values in the approved cost break-down tables will be used to determine partial payments during the progress of the work and as the basis for calculating an adjustment in compensation for the contract lump sum items of highway planting and irrigation system due to changes in line items of work ordered by the Engineer. When the total of ordered changes to line items of work increases or decreases the lump sum price bid for either Highway Planting or Irrigation System by more than 25 percent, the adjustment in compensation for the applicable lump sum item will be determined in the same manner specified for increases and decreases in the total pay quantity of an item of work in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

HIGHWAY PLANTING COST BREAK-DOWN

Contract No. 04-130524

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
ROADSIDE CLEARING	LS	LUMP SUM		
PREPARE HOLE	EA	123		
MULCH	M3	5		
COMMERCIAL FERTILIZER (PACKETS)	EA	123		
COMMERCIAL FERTILIZER (SLOW RELEASE)	KG	28		
SOIL AMENDMENT	M3	3.7		
PLANT (GROUP A)	EA	123		

TOTAL _____

IRRIGATION SYSTEM COST BREAK-DOWN

Contract No. 04-130524

UNIT DESCRIPTION	UNIT	APPROXIMATE QUANTITY	VALUE	AMOUNT
CONTROL AND NEUTRAL CONDUCTORS	LS	LUMP SUM		
25 MM ELECTRIC REMOTE CONTROL VALVES	EA	1		
20 MM PLASTIC PIPE (PR 200)(SUPPLY LINE)	M	6		
25 MM PLASTIC PIPE (PR 200)(SUPPLY LINE)	M	15		
32 MM PLASTIC PIPE (PR 200)(SUPPLY LINE)	M	2		
50 MM PLASTIC PIPE (PR 200)(SUPPLY LINE)	M	2		
SPRINKLER (TYPE B-2)	EA	6		
50 MM BACKFLOW PREVENTER ASSEMBLY	EA	1		
BACKFLOW PREVENTER ASSEMBLY ENCLOSURE	EA	1		
IRRIGATION CONTROLLER (2 STATION)	EA	1		
20 MM QUICK COUPLER VALVE	EA	1		

TOTAL _____

10-2.02 HIGHWAY PLANTING

The work performed in connection with highway planting shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

HIGHWAY PLANTING MATERIALS

Mulch

Mulch shall be wood chips.

Commercial Fertilizer (Slow Release)

Commercial fertilizer (slow release) shall be a pelleted or granular form, shall be slow or controlled release with a nutrient release over an 8- to 12-month period, and shall fall within the following guaranteed chemical analysis range:

Ingredient	Percentage
Nitrogen	16-21
Phosphoric Acid	6-8
Water Soluble Potash	4-10

Commercial Fertilizer (Packets)

Commercial fertilizer (packet) shall be slow or controlled release and shall be in a biodegradable packet form. The packet shall gradually release nutrients over a 12-month period. Each packet shall have a mass of $10 \text{ g} \pm 1 \text{ g}$ and shall have the following guaranteed chemical analysis:

Ingredient	Percentage
Nitrogen	20
Phosphoric Acid	10
Water Soluble Potash	5

ROADSIDE CLEARING

Prior to preparing planting areas or commencing irrigation trenching operations for planting areas, trash and debris shall be removed from these areas and a distance of 3 m beyond the edges of those areas. At locations where proposed planting areas are 3.6 m or more from the edges of dikes, curbs, sidewalks, fences, walls, and paved shoulders the clearing limit shall be 2 m beyond the outer limits of the proposed planting area.

In addition to removing trash and debris, the project area shall be cleared as specified herein:

- A. At the option of the Contractor, removed trees and shrubs may be reduced to chips. Chipped material shall be spread within the project limits at locations designated by the Engineer. Chipped material shall not be substituted for mulch, nor shall the chipped material be placed within areas to receive mulch.
- B. Weeds shall be killed and removed within proposed ground cover areas and within the area extending beyond the outer limits of the proposed ground cover areas to the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, existing planting and fences. At those locations where proposed ground cover areas are 3.6 m or more from the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, and fences, the clearing limit shall be 2 m beyond the outer limits of the proposed ground cover areas.
- C. Weeds shall be killed and removed within proposed mulch areas and within the area extending beyond the outer limits of the proposed mulch areas to the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, existing planting and fences. At those locations where proposed mulch areas are 3.6 m or more from the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, and fences, the clearing limit shall be 2 m beyond the outer limits of the proposed mulch areas.
- D. Weeds shall be killed and removed within planting areas where plants are to be planted in groups or rows 4.6 m or less apart and from within an area extending 2 m beyond the outer limits of the groups or rows of plants.
- E. Existing ground cover shall be killed and removed from within an area 2 m in diameter centered at each proposed plant location within existing ground cover areas.

After the initial roadside clearing is complete, additional roadside clearing work shall be performed as necessary to maintain the areas, as specified above, in a neat appearance until the start of the plant establishment period. This work shall include the following:

- A. Trash and debris shall be removed.
- B. Rodents shall be controlled.
- C. Weed growth shall be killed before the weeds reach the seed stage of growth or exceed 150 mm in length.
- D. Existing ground cover shall be killed and removed from within the 2-m diameter areas specified for each proposed plant location within the existing ground cover areas.
- E. Weeds in plant basins, including basin walls, shall be removed by hand pulling, after the plants have been planted.

Weed Control

Weed control shall also conform to the following:

- A. Stolon type weeds shall be killed with glyphosate.
- B. Removed weeds and ground cover shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Roadside clearing work shall not include work required to be performed as clearing and grubbing as specified in Section 16, "Clearing and Grubbing," of the Standard Specifications.

PESTICIDES

Pesticides used to control weeds shall conform to the provisions in Section 20-4.026, "Pesticides," of the Standard Specifications. Except as otherwise provided in these special provisions, pesticide use shall be limited to the following materials:

Cacodylic Acid
 Diquat
 Fluazifop-butyl
 Glyphosate
 Sethoxydim
 Ammonium Sulfate
 Magnesium Chloride

Glyphosate shall be used to kill stolon type weeds.

Ammonium sulfate and magnesium chloride shall be used only in areas planted to *Carpobrotus* or *Delosperma*. Ammonium sulfate and magnesium chloride shall not be applied in a manner that allows the pesticides to come in contact with trees or shrubs.

If the Contractor elects to request the use of other pesticides on this project, the request shall be submitted, in writing, to the Engineer not less than 15 days prior to the intended use of the other pesticides. Except for the pesticides listed in these special provisions, no pesticides shall be used or applied without prior written approval of the Engineer.

Pesticides shall not be applied within the limits of the plant basins. Pesticides shall not be applied in a manner that allows the pesticides to come in contact with the foliage and woody parts of the plants.

PREPARING PLANTING AREAS

Plants adjacent to drainage ditches shall be located so that after construction of the basins, no portion of the basin walls shall be less than the minimum distance shown on the plans for each plant involved.

PLANTING

Backfill material for plant holes shall be a mixture of soil and soil amendment. The quantity of soil amendment shall be as shown on the Plant List. Soil amendment shall conform to the provisions in Section 20-2.03, "Soil Amendment," of the Standard Specifications. Backfill material shall be thoroughly mixed and uniformly distributed throughout the entire depth of the plant hole without clods and lumps.

Commercial fertilizer (pelleted and granular) shall be applied or placed at the time of planting and at the rates shown on the Plant List and in conformance with the provisions in Section 20-4.05, "Planting," of the Standard Specifications and these special provisions.

Commercial fertilizer packets shall be placed in the backfill of each plant at the time of planting and at the rate shown on the Plant List to within 150 to 200 mm of the soil surface and approximately 25 mm from the roots. When more than one fertilizer packet is required per plant, the packets shall be distributed evenly around the root ball.

Mulch placed in areas outside of plant basins shall be spread to a uniform depth of 75 mm.

Mulch shall not be placed within one meter of the centerline of earthen drainage ditches, within one meter of the edge of paved ditches, and within one meter of the centerline of drainage flow lines.

Attention is directed to "Irrigation Systems Functional Test" of these special provisions regarding functional tests of the irrigation systems. Planting shall not be performed in an area until the functional test has been completed for the irrigation system serving that area.

PLANT ESTABLISHMENT WORK

The plant establishment period shall be Type 2 and shall not be less than 120 working days.

Commercial fertilizer (slow release) shall be applied to shrubs, and ground cover 20 days before the end of the plant establishment period. Commercial fertilizer shall be applied at the rates shown on the plans and shall be spread with a mechanical spreader wherever possible.

Weeds within plant basins, including basin walls and ground cover, shall be controlled by hand pulling.

Weeds within mulched and ground cover areas and outside of plant basins shall be controlled by killing.

Weeds within median areas, pavement, curbs, sidewalk, and other surfaced areas shall be controlled by killing.

At the option of the Contractor, plants of a larger container size than those originally specified may be used for replacement plants during the plant establishment period. The use of plants of a larger container size than those originally specified for replacement plants shall be at the Contractor's expense.

The final inspection shall be performed in conformance with the provisions in Section 5-1.13, "Final Inspection," of the Standard Specifications and shall be completed a minimum of 20 working days before the estimated completion of the contract.

10-2.03 IRRIGATION SYSTEMS

Irrigation systems shall be furnished and installed in conformance with the provisions in Section 20-5, "Irrigation Systems," of the Standard Specifications, except materials containing asbestos fibers shall not be used.

Attention is directed to the provisions in "Obstructions" of these special provisions, regarding work over or adjacent to existing underground facilities. Excavation for proposed irrigation facilities shall not be started until the existing underground facilities have been located.

Method A pressure testing shall conform to the provisions in Section 20-5.03H(1), "Method A", of the Standard Specifications, except leaks that develop in the tested portion of the system shall be located and repaired after each test period when a drop of more than 35 kPa is indicated by the pressure gage. After the leaks have been repaired, the one hour pressure test shall be repeated and additional repairs made until the drop in pressure is 35 kPa or less.

VALVE BOXES

Valve boxes shall conform to the provisions in Section 20-2.24, "Valve Boxes," of the Standard Specifications, except as otherwise provided herein.

Valve boxes shall be precast portland cement concrete.

Covers for concrete valve boxes shall be concrete.

Valve boxes shall be identified on the top surface of the covers by stenciling with paint the appropriate abbreviations for the irrigation facilities contained in the valve boxes as shown on the plans. Valve boxes that contain remote control valves shall be identified by the appropriate letters and numbers (controller and station numbers). The letters and numbers shall be 50 mm in height. The stenciling paint shall be a commercial quality, epoxy resin base paint of a color which contrasts with the valve box covers.

ELECTRIC AUTOMATIC IRRIGATION COMPONENTS

Irrigation Controllers

Irrigation controllers shall be single, solid-state independent controllers conforming to the following:

- A. Irrigation controller shall have 2 stations.
- B. Irrigation controller shall be operated by a 9 volt battery.
- C. Irrigation controller shall be programmed by a hand held device.
- D. Irrigation controller shall be totally submersible in water.
- E. Irrigation controller shall be installed in the valve box.
- F. The valve solenoid shall be as per recommendation by the manufacturer of the battery operated controller.

Electric Remote Control Valves

Electric remote control valves shall conform to the provisions in Section 20-2.23, "Control Valves," of the Standard Specifications and the following:

- A. Valves shall be polyvinyl chloride (PVC) construction.
- B. Valves shall be angle pattern (bottom inlet) as shown on the plans.

Pull Boxes

Pull box installations shall conform to the provisions in Section 20-5.027I, "Conductors, Electrical Conduits and Pull Boxes," of the Standard Specifications.

Conductors

Low voltage, as used in this section "Conductors," shall mean 36 V or less.

Low voltage control and neutral conductors in pull boxes and valve boxes, at irrigation controller terminals, and at splices shall be marked as follows:

- A. Conductor terminations and splices shall be marked with adhesive backed paper markers or adhesive cloth wrap-around markers, with clear, heat-shrinkable sleeves sealed over the markers.
- B. Non-spliced conductors in pull boxes and valve boxes shall be marked with clip-on, "C" shaped, white extruded polyvinyl chloride sleeves. Marker sleeves shall have black, indented legends of uniform depth with transparent overlays over the legends and "chevron" cuts for alignment of 2 or more sleeves.

Markers for the control conductors shall be identified with the appropriate number or letter designations of irrigation controllers and station numbers. Markers for neutral conductors shall be identified with the appropriate number or letter designations of the irrigation controllers.

The color of low voltage neutral and control conductor insulation, except for the striped portions, shall be homogeneous throughout the entire thickness of the insulation.

Insulation for conductors may be UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 1.05 mm for wire sizes 10AWG and smaller.

ARMOR-CLAD CONDUCTORS

Armor-clad conductors shall be used in direct burial applications from pull boxes adjacent to irrigation controller to remote control valves and other irrigation facilities in conformance with the details shown on the plans and these special provisions.

Armor-clad conductors shall conform to the following:

- A. Conductors shall be the proper size for the application, and shall be solid, uncoated copper with a conductor size not less than 90 percent of the AWG diameter required.
- B. At the Contractor's option, conductor insulation coverings shall be either of the following:
 - 1. Polyvinyl chloride (PVC) conforming to UL style, Type UF 60°C, 600 V. Average thickness of insulation shall be not less than 1.52 mm, with a minimum thickness of 1.37 mm, or
 - 2. UL listed polyethylene conforming to UL44 test standards with a minimum insulation thickness of 1.05 mm for wire sizes 10AWG and smaller.
- C. Armor shall be a minimum 0.13-mm thick by 12.7 mm wide Type 304 stainless steel tape that is helically wrapped over each conductor with a 33 percent minimum overlap.
- D. Outer jacket for conductors shall be sunlight resistant PVC and shall conform to the Insulated Power Cable Engineer's Association (ICEA) S-61-402, NEMA Standard WC5, and UL Listing 1263. Nominal thickness of the outer jacket shall be 0.76-mm with a minimum thickness of 0.61-mm.

At the option of the Contractor, conductors conforming to the provisions in Section 20-2.31D, "Conductors," of the Standard Specifications may be used when the conductors are installed in an electrical conduit.

IRRIGATION SYSTEMS FUNCTIONAL TEST

Functional tests for the irrigation controllers and associated automatic irrigation systems shall conform to the provisions in Section 20-5.027J, "Testing," of the Standard Specifications and these special provisions.

Tests shall demonstrate to the Engineer, through one complete cycle of the irrigation controllers in the automatic mode, that the associated automatic components of the irrigation systems operate properly. If automatic components of the irrigation systems fail a functional test, these components shall be repaired at the Contractor's expense and the testing repeated until satisfactory operation is obtained.

Associated automatic components shall include, but not be limited to remote control valves.

Upon completion of work on an irrigation system, including correction of deficiencies and satisfactory functional tests for the systems involved, the plants to be planted in the area watered by the irrigation system may be planted provided the planting areas have been prepared as specified in these special provisions.

PIPE

Steel Pipe

Galvanized steel pipe supply lines installed between water meters and backflow preventer assemblies shall be installed not less than 500 mm below finished grade, measured to the top of the pipe.

Plastic Pipe

Plastic pipe supply lines shall be polyvinyl chloride (PVC) 1120 or 1220 pressure rated pipe with the minimum pressure rating (PR) shown on the plans.

Plastic pipe supply lines less than 100 mm in diameter shall have solvent cemented type joints. Primers shall be used on the solvent cemented type joints.

A nonhardening joint compound shall be used in place of the pipe thread sealant tape conforming to the provisions in Section 20-5.03E, "Pipe," of the Standard Specifications. Joint compounds shall be applied in conformance with the manufacturer's recommendations.

Fittings for plastic pipe supply lines with a pressure rating (PR) of 315 shall be Schedule 80.

BACKFLOW PREVENTER ASSEMBLIES

Backflow preventers shall conform to the provisions in Section 20-2.25, "Backflow Preventers," of the Standard Specifications and these special provisions.

Pressure loss through the backflow preventer shall not exceed the following:

BACKFLOW PREVENTER SIZE (millimeters)	FLOW RATE (Liters per minute)	PRESSURE LOSS (kPa)
50	450	10

Backflow preventer assemblies shall be painted with a minimum of 2 applications of a commercial quality enamel paint. The color of the paint shall be forest green.

BACKFLOW PREVENTER ASSEMBLY ENCLOSURE

Enclosure shall be fabricated of structural steel angles and flattened expanded metal and shall be installed over backflow preventer assemblies on a portland cement concrete pad as shown on the plans and in conformance with these special provisions.

Expanded metal for sides, ends and top panels shall be fabricated from 1.9 mm (14-gage), minimum thickness, sheet steel. The flattened expanded metal openings shall be approximately 20 mm by 45 mm in size.

Expanded metal panels shall be attached to the steel frames by a series of welds, not less than 6.4 mm in length and spaced not more than 100 mm on centers, along the edges of the enclosure.

Padlock will be State-furnished in accordance with "State-furnished Materials" of these special provisions.

Enclosure shall be galvanized, after fabrication, in conformance with the provisions in Section 75-1.05, "Galvanizing," of the Standard Specifications.

Concrete for the concrete pad shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications.

Hold down bolt assemblies shall be galvanized and shall be installed when the portland cement concrete pad is still plastic. Nuts shall be hexagonal and washers shall be the lock type.

Enclosure shall be painted with one application of a commercial quality pre-treatment, vinyl wash primer and a minimum of one application of a commercial quality, exterior enamel for metal. The finish color shall be forest green.

All parts of the backflow preventer assembly enclosure, including hold down assemblies, may be constructed of stainless steel instead of standard steel materials specified above. Stainless steel enclosures shall conform to the provisions herein except galvanizing, priming and painting shall not be required. Stainless steel enclosures shall be powder coated a light brown color by the manufacturer.

The minimum clearance between the backflow preventer assembly and the backflow preventer assembly enclosure shall be 50 mm.

TESTING NEW BACKFLOW PREVENTERS

New backflow preventer shall be tested for proper operation in conformance with the provisions in Section 20-5.03J, "Check and Test Backflow Preventers," of the Standard Specifications and these special provisions.

Tests for new backflow preventer shall be satisfactorily completed after installation and before operation of the irrigation systems.

New backflow preventer shall be retested one year after the satisfactory completion of the previous test, and each year thereafter until the plant establishment period is completed. An additional test shall be provided not more than 10 days prior to acceptance of the contract.

SPRINKLERS

Sprinklers shall conform to the type, pattern, material, and operating characteristics listed in the "Sprinkler Schedule" shown on the plans.

FINAL IRRIGATION SYSTEM CHECK

A final check of new irrigation facilities shall be performed not more than 20 working days prior to acceptance of the contract.

The length of watering cycles using potable water measured by water meters for the final check of irrigation facilities will be determined by the Engineer.

Remote control valves connected to new irrigation controllers shall be checked for automatic performance when the controllers are in automatic mode.

Unsatisfactory performance of irrigation facilities installed or modified by the Contractor shall be repaired and rechecked at the Contractor's expense until satisfactory performance is obtained, as determined by the Engineer.

Nothing in this section "Final Irrigation System Check" shall relieve the Contractor of full responsibility for making good or repairing defective work or materials found before the formal written acceptance of the entire contract by the Director.

Full compensation for checking the irrigation systems prior to the acceptance of the contract shall be considered as included in the contract lump sum price paid for plant establishment work and no additional compensation will be allowed therefor.

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION

Traffic signals, cabinet, electric service (irrigation), ramp metering system, and electrical and telephone service connections shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Unless shown otherwise, locations of cabinets, standards, foundations, lighting fixtures, conduits, pull boxes, appurtenances and other similar electrical equipment are approximate and may be changed to suit field conditions or as directed by the Engineer.

10-3.02 COST BREAK-DOWN

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

10-3.03 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

Traffic signal system shutdowns shall be limited to periods between the hours of 9:00 a.m. and 3:00 p.m.

At least three working days prior to performing any work on each existing system, the Contractor shall notify the County Engineer, Phone (510) 670-6456.

10-3.04 FOUNDATIONS

Sleeve nuts shall be used on Type 1-B standard. Foundations for Type 1-B standards shall conform to the details on Standard Plan ES-7B, "Anchor Bolts With Sleeve Nuts", except that the bottom of the base plate shall be flush with the finished grade.

10-3.05 STANDARDS, STEEL PEDESTALS, AND POSTS

Steel bolts not designated on the plans as high-strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307.

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

Mast arm mounted street name signs shall be installed on signal mast arms at the locations shown on the plans. The street name signs and mounting hardware (except straps, seals, and saddle brackets) will be State-furnished in conformance with the provisions in "Materials" of these special provisions. The State-furnished hanger assembly will be similar to that shown for internally illuminated street name signs. The mounting hardware and sign shall be assembled. The assembly shall be attached to the mast arm using a 19 mm x 0.53 mm stainless steel strap in a manner similar to the strap and saddle bracket method shown on the plans. The band shall be wrapped at least twice around the mast arm, tightened, and secured with a stainless strap seal in the same manner shown for strap and saddle bracket sign mounting. Straps, seals, and saddle brackets shall be furnished by the Contractor. The sign panel shall be leveled and hardware securely tightened.

Handhole reinforcement rings for standards, steel pedestals, and posts shall be continuous around the handholes.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

10-3.06 CONDUIT

Conduit to be installed underground shall be Type 1 or Type 3 unless otherwise specified. Detector termination conduits shall be Type 3-. The conduit in a foundation and between a foundation and the nearest pull box shall be Type 1.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled with commercial quality concrete, containing not less than 250 kg of portland cement per cubic meter, to not less than 100 mm above the conduit before additional backfill material is placed.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9-m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and telephone demarcation cabinet shall be sealed with an approved type of sealing compound.

At those locations where conduit is required to be installed under pavement and existing underground facilities require special precautions in conformance with the provisions in "Obstructions" of these special provisions, conduit shall be placed by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications.

At locations where conduit is required to be installed under pavement and if a delay to vehicles will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method."

10-3.07 PULL BOXES

Grout shall not be placed in the bottom of new or existing pull boxes.

10-3.08 CABLES, CONDUCTORS AND WIRING

Splices shall be insulated by "Method B".

The minimum insulation thickness, at any point, for Type USE, RHH or RHW wire shall be 1.0 mm for conductor sizes No. 14 to No. 10, inclusive, and 1.3 mm for No. 8 to No. 2, inclusive. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 0.69 mm for conductor sizes No. 14 to No. 10, inclusive, 1.02 mm for No. 8, and 1.37 mm for No. 6 to No. 2, inclusive.

Signal cable shall not be used.

10-3.09 BONDING AND GROUNDING

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in conduits, except when the conduits contain combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits, except for series lighting circuits, where No. 6 bare copper wire shall run continuously. The bonding wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

10-3.10 SERVICE

Type III service equipment enclosures shall be the aluminum type.

Circuit breakers shall be the cable-in/cable-out type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

The neutral conductor shall run from the service equipment enclosure to the controller cabinet without splicing to any other neutral conductor.

The clearance between the bottom of the lowest circuit breaker and the bottom of the service equipment enclosure for a Type III-A series shall be 600 mm minimum.

ELECTRIC SERVICE (IRRIGATION)

Electric service (irrigation) shall be from the service points to the irrigation controllers (IC) and to the spaces provided in the irrigation controller enclosure cabinets (CEC) for irrigation controllers as shown on the plans.

Irrigation Controller (IC) A: Electric service (irrigation) shall be a metered 120/240 V(ac), single-phase service in a Type III service equipment enclosure.

The inscription on other nameplates shall be the identifying letter designation used on the plans and in these special provisions, or shall be as directed by the Engineer.

Electric service (irrigation) will be paid for on a lump sum basis.

The contract lump sum price paid for electric service (irrigation) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing electric service (irrigation) for irrigation controllers, complete in place, including conductors, conduit and pull boxes to the pull box adjacent to irrigation controller enclosure cabinets and irrigation controllers, as shown on the plans, as specified in these special provisions, and as directed by the Engineer.

10-3.11 NUMBERING ELECTRICAL EQUIPMENT

The placement of numbers on electrical equipment will be done by others.

10-3.12 TELEPHONE DEMARCATION CABINET

The Contractor shall furnish and install all cable assemblies, punch block, and connecting blocks inside the TDC, except those that are provided by the telephone company (TELCO), as shown on the plans and as directed by the Engineer.

Ground rod shall meet the requirements of NEC Article 250-84.

Padlockable drawer latch shall be padlock hasp.

Backboard C shall be secured by a retaining screw.

Duplex outlet and GFCI duplex outlet shall be separately connected to the main circuit breaker.

The bottom plate for TDC shall be 3.2 mm aluminum.

10-3.13 VEHICLE SIGNAL FACES AND SIGNAL HEADS

Light emitting diode (LED) signal modules for vehicular traffic signal units (except programmed visibility type) will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.14 PEDESTRIAN SIGNALS

Light emitting diode (LED) signal modules for Type A pedestrian signals will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

10-3.15 DETECTORS

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop wire shall be Type 2.

Loop detector lead-in cable shall be Type B.

Slots shall be filled with elastomeric sealant or hot-melt rubberized asphalt sealant.

At the Contractor's option, where a Type A or a Type B loop is designated on the plans, a Type E loop may be substituted. Substitution is not allowed at locations where a Type D and Type A loops are designated on the plans in a single lane.

For Type E detector loops, sides of the slot shall be vertical and the minimum radius of the slot entering and leaving the circular part of the loop shall be 40 mm. Slot width shall be a maximum of 20 mm. Loop wire for circular loops shall be Type 2. Slots of circular loops shall be filled with elastomeric sealant or hot melt rubberized asphalt sealant.

Where one traffic signal detector consists of a sequence of 4 loops in a single lane, the front loop closest to the limit line or crosswalk shall be located 0.3 m from the line. All 4 loops in each lane shall be connected in series.

10-3.16 LUMINAIRES

Ballasts shall be the lag or lead regulator type.

10-3.17 INTERNALLY ILLUMINATED SIGNS

The "METER ON" sign shall be a Type A pedestrian signal modified so that the reflector shall be a single chamber with 2 incandescent lamps.

The message shall be white "METER ON" as shown on the plans. White color shall be in conformance with the provisions in Section 86-4.06, "Pedestrian Signal Faces," of the Standard Specifications.

Lenses shall be 4.8-mm, minimum thickness, clear acrylic or polycarbonate plastic or 3-mm nominal thickness glass fiber reinforced plastic, with molded, one piece, neoprene gasket. Message lettering for "METER" shall be "Series C," 113 mm high, with uniform 13-mm stroke, and for "ON" shall be "Series C," 150 mm high, with uniform 25-mm stroke. Letters shall be clear, transparent or translucent, with black opaque background silk screened on to the second surface of the lens.

10-3.18 PHOTOELECTRIC CONTROLS

Contactors shall be the mercury type.

10-3.19 GENERAL PACKET RADIO SYSTEM WIRELESS MODEM ASSEMBLY

The General Packet Radio System (GPRS) Wireless Modem Assembly shall be configured with the following major components:

- A. Modem
- B. Power supply
- C. Modem mounting bracket and hardware

- D. Serial communication cable
- E. Antenna

MODEM

All modems shall be configurable remotely through the wireless network and through the modem serial port. The contractor shall configure all modems prior to acceptance. The contractor shall provide the Engineer with the modem serial and SIM numbers 30 days prior to requiring the PDP context. The Engineer will make available the PDP context comprising the IP (assigned) and APN (obtained from service provider) and configuration parameters (if different from those listed below) after the serial and SIM numbers are provided to the Engineer by the Contractor. All modems shall be complete with all cables, conductors, hardware, antenna and other equipment as required to make the system completely operational. Location and mounting of the equipment shall be directed by the Engineer and details shown on the plans. The modems shall be fully compliant with PCCA STD-101.

Environmental Requirements

The operating temperature range of the modem shall range from -30°C to +70°C, with humidity from 5 percent to 95 percent (non-condensing) and have transmissions at 10 percent duty cycle above 60°C.

Physical Characteristics

The modem shall weigh less than 1 kg and shall have overall dimensions of less than 180 mm × 90 mm × 30 mm. The housing shall be constructed of anodized aluminum.

The modem shall have the following status indicators:

1. Power (on).
2. Channel acquired.
3. Link status.
4. Network registration.
5. Received signal strength indicator.
6. Transmit and receive data.
7. Block errors.

Operational Parameters

The modem shall operate in a dynamic IP addressing environment of GPRS Networks at 1900/850 MHz and meet the following operational parameters:

Transmit power at antenna port	1.0 W for 1900 MHz 0.8 W for 850 MHz
Transmit frequency	1850-1910 MHz and 824-849 MHz
Receiver frequency	1930-1990 MHz and 869-894 MHz
Receiver sensitivity	-107 dBm (2.439 % bit error rate)
Input voltage	10 VDC to 28 VDC
Input current	40 mA to 200 mA

Application Interfaces

The modem shall have the following standard interfaces:

1. The AT command serial character stream uses TCP/IP.
2. Host communicates with modem using either UDP or TCP packet modes.
3. Computer terminal platform using Windows 98/2000/NT and Dial-Up Networking communicates with the modem using PPP.

Features

The modem shall have the following features:

1. 53.6 kbps raw data transfer rate minimum.
2. Full duplex transceiver.
3. 1900/850 MHz dual band networking.

4. Integrated TCP/IP protocol stack with UDP.
5. Security such to prevent unauthorized access.
6. Includes a DC power cable at least 1 meter in length with a connector compatible with the modem power connector.
7. Packet buffering and forwarding feature that provides discipline to the output of the serial port. The packet forwarding time interval shall be configurable from a rate of 0 (undisciplined) to 400ms in increments of 100ms or less.
8. Choice of "Friends Only" access mode.

Configuration parameters

The modem shall be configured with the following parameters (using the default AT command mode):

Command	Current value and Description
ADBGP=n(?)	n=0
AIP=n(?)	n=1: Allow any incoming IP to connect when UDP auto answer is enabled.
DAE=n(?)	n=0: Enable +++AT escape sequence detection.
E=n(?)	n=1: Toggle AT command echo On.
FM=n(?)	n=0: Disable Friends mode.
HOR=n(?)	n=0: No response codes when UDP session is initiated.
I0?	#####GPRS: Returns the product name.
I1?	#####: Returns firmware version, hardware ID, and copyright.
I2?	#####: Returns firmware version and relevant hardware ID.
I3?	#####: Returns the OEM Modem's unique ID.
MD=nn(?)	nn=00: normal (AT command) mode.
MVLEN=n(?)	n=0: Modbus-Variant length
MVMSK=nn(?)	nn=00:Modbus-Variant ID Mask
MVOFF=n(?)	n=0:Modbus-Variant offset
MVTYP=n(?)	n=0: Modbus –Variant Type
Q=n(?)	n=1: Quiet-mode On
RKEY=n(?)	n=0: Disable Transceiver Keying
S0=n(?)	n=1: On, TCP Auto Answer Mode
S7=nn(?)	nn=30: TCP Establishment Timeout in seconds
S23=<speed>,<databits>,<parity>,<stopbits>	9600,8,N,1: Serial line parameters are set
S50=n(?)	n=1: Data Forwarding Timeout in tenths of seconds
S51=n(?)	n=0: No Data Forwarding character
S53=d/[ppppp](?)	T/12345: Destination IP address,port and method
S60=n(?)	n=1: Telnet echo mode, Local echo(Default)
S82=n(?)	n=2: Enable UDP auto answer mode
S83=n(?)	n=10: UDP auto answer timeout in seconds

S110=d.d.d.d/[ppppp](?)	192.168.36.24/12345: IP address and port for GPRS modems
S211=n(?)	n=1: Ignore DTR.
S221=n(?)	n=1: Delay Connect Response in seconds.
TCPS=n(?)	n=0: TCP connection timeout in minutes.
TCPT=n(?)	n=6: TCP inactive timeout in minutes.
V=n(?)	n=1: Command Response Mode, Verbose(default)
&C=n(?)	n=1: Assert DCD when in a data mode.
&D=n(?)	n=0: Ignore DTR
&S=n(?)	n=1: Assert DSR when in a data mode.
*CTSE=n(?)	n=0: Clear To Send Enable, Disabled (default)
*DATE=[mm/dd/yyyy],[hh:mm:ss](?)	Sets the date and time, hours specified in 24-hours format.
*DATZ=n(?)	n=0: Normal Reset (default) on ATZ.
*DEVICEID=n(?)	Queries the 64-bit Device ID that is used by the modem to identify itself to the server.
*DNS1=d.d.d.d(?)	209.183.48.10: Sets the DNS addresses to be returned during the PPP negotiations.
*DNS2=d.d.d.d(?)	209.183.48.11: Sets the DNS addresses to be returned during the PPP negotiations.
*DPORT=n(?)	12345: Sets the modem's Device Port.
*DU=n(?)	n=0: dial command always uses UDP.
*ENQ=n(?)	n=0: Outputs an ENQ after the TCP CONNECT delay, Disabled (default).
*HOSTPRIVMODE=n(?)	n=0: public IP to be used when the Host initiates a PPP connection to the modem.
*HOSTPRIVIP=d.d.d.d(?)	0.0.0.0: private IP address if *HOSTPRIVMODE=1
*IPMANAGER1=d.d.d.d(?)	155.173.38.215: IP addresses to send IP change notifications to.
*IPMANAGER2=d.d.d.d(?)	155.173.38.210: Second IP address to send IP notifications to.
*IPMGRKEY1=[key](?)	0000000000: Sets the 128-bit key to use to authenticate the IP update notifications. If the key's value is all zeros, a default key will be used, with IPMANAGER1.
*IPMGRKEY2=[key](?)	0000000000: Sets the 128-bit key to use to authenticate the IP update notifications. If the key's value is all zeroes, default key will be used with IPMANAGER2.
*IPMGRUPDATE1=n(?)	xx: Sets the number of minutes to periodically send an IP update to IPMANAGER1.
*IPMGRUPDATE2=n(?)	xx: Sets the number of minutes to periodically send an IP update to IPMANAGER2.
*MODEMNAME=[name](?)	Name of the modem(up to 20 characters long) to use when performing IP change notices to IPManager. This name should not be a fully qualified domain name, but simply the first portion.

*MSCIUPDADDR=[name/port](?)	Modem Status Update Address-where Name/Port is the domain name and port of the machine where the modem status updates will be sent.
*MSCIUPDPERIOD=n(?)	Modem status update period- where n is in minutes.
*NETCHAN?	Returns the current active channel number.
*NETIP?	Queries the current public(network) IP address of the modem. Note: This could be 0.0.0.0 if there is no current network IP.
*NETPHONE?	Queries the device's phone number, if applicable.
*NETPW=pw(?)	The password that is used to login to wireless network.
*NETRSSI?	Returns the current RSSI of the modem as a negative dBm value.
*NETSTATE?	Queries the current network state.
*NETUID=[uid](?)	The login that is used to login to the network,when required
*TPORT=ppppp(?)	Sets or queries the port used for the AT Telnet server. Valid values are 0-65535.
*UALL=n(?)	n=0: No(default).If there is no UDP session active, an incoming UDP packet will be treated according to the UDP auto answer and AIP settings.
*UDPLAST=n(?)	n=0. Does not change S53 setting.(default). If enabled,sets S53 to the last accepted IP address through UDP auto answer.

System Compliance

The modem and associated firmware, software, hardware, protocol, and other features shall be fully and completely compatible with the existing GPRS network currently in use. The existing GPRS network utilizes the AT&T Wireless (now Cingular) cellular system (band compatible with this modem), the AirLink Raven GPRS modem, and the AirLink Gateway. The Contractor shall demonstrate the compatibility to the Engineer by actual installation demonstration or by other means approved by the Engineer.

Installation

The installation of the modem shall be according to the plans, the manufacturer's instructions, and adjusted per field conditions with the Engineers approval.

Certificate of Compliance

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in accordance with the provisions of Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for all of the modems furnished for the project.

Warranty

The manufacturer shall provide a written warranty against defects in materials and workmanship for modems for a period of 12 months after installation for parts and labor. Replacement modems shall be provided within 5 days after receipt of failed modem at no cost to the State, except the cost of shipping the failed modem. All warranty documentation shall be given to the Engineer prior to installation. Replacement modems shall be delivered to Caltrans Maintenance Electrical Shop at 30 Rickard Street, San Francisco, CA 94134.

The software warranty shall be for one (1) year, including upgrades and feature enhancements.

POWER SUPPLY

The power supply shall be vertically mountable on a 483-mm standard rack rail using existing mounting hardware. An existing mounting hardware sample is available upon request; the Contractor may pick it up at 111 Grand Avenue, Oakland. The Contractor shall return the sample if it is not used in the installation. The power supply shall have provision to attach the modem power cable securely without the need for modifying the modem power cable.

The power supply shall meet the following requirements:

Power Cord	Standard 120 V(ac), 3 prong cord, at least 1 meter in length (may be added by Contractor)
Type	Switching mode type
Power Rated	40 W minimum with no minimum load required
Operating Temperature Range	From -30°C to +70°C
Operating Humidity Range	From 5 percent to 95 percent non-condensing
Input Voltage	From 85 V (ac) to 264 V (ac) or 120 V (dc) to 370 V (dc)
Input Frequency	From 47 Hz to 63 Hz
Inrush Current	Cold start, 25 A at 115 V
Output Voltage	12 V (dc), adjustable over a ±10 percent range
Overload Protection	From 105 percent to 150 percent in output pulsing mode
Over Voltage Protection	From 115 percent to 135 percent of output voltage
Setup, Rise, Hold Up Time	800 ms, 50 ms, 15 ms at 115 V (ac)
Withstand Voltage	I/P-O/P: 3 kV, I/P-FG: 1.5 kV, for 60 seconds
Working Temperature*	70°C@30%
Safety Standards	UL 1012, TUV EN60950
EMC Standards	EN55022 Class B, EN61000-4-2, 3, 4, 5 and EN61000-3-2, 3

- Note: A substitute may be proposed by the Contractor which meets the 70°C environmental rating at a lower load percentage as long as the temperature rating is maintained at the maximum modem load and all other electrical specifications are met.

Certificate of Compliance

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in accordance with the provisions of Section 6-1.07, "Certificates of Compliance" of the Standard Specifications for all of the power supplies furnished for the project.

Warranty

The manufacturer shall provide a written warranty against defects in materials and workmanship for power supplies for a period of 12 months after installation for parts and labor. Replacement power supplies shall be provided within 5 days after receipt of failed power supply at no cost to the State, except the cost of shipping the failed power supply. All warranty documentation shall be given to the Engineer prior to installation. Replacement power supplies shall be delivered to Caltrans Maintenance Electrical Shop at 30 Rickard Street, San Francisco, CA 94134.

MODEM MOUNTING BRACKET AND HARDWARE

The mounting bracket and hardware shall be stainless steel. The mounting bracket shall securely hold the modem in a vertical attitude with all cables and conductors installed. The mounting bracket shall contain the modem using a method that allows the removal of the modem without tools or without removing the bracket from its attachment to the cabinet frame.

D SERIAL COMMUNICATION CABLE

Where the modem is designed to interface with a Model 170E controller, the Contractor shall provide a communication cable known as the C2 cable. The C2 cable shall interface the Model 170E controller C2 connector and the GPRS modem and include all conductors and connectors required for that purpose. The GPRS modem connector shall meet EIA RS-232 standard using a DB-9 connector. The Model 170E controller end connector shall comply with AMP 201360-2-ND or equivalent. All pins in both connectors shall be gold plated. The cable shall have four No. 20 AWG conductors with (UL) Type CM shielded or AWM 2464 80C 300 Volts – C (UL) CMG. The cable shall be at least 1 meter long. The cable wiring shall comply with the following:

AMP 201360-2-ND -L to DB9-P - 2
AMP 201360-2-ND -K to DB9-P - 3
AMP 201360-2-ND -N to DB9-P - 5
AMP 201360-2-ND -D to AMP 201360-2-ND - H
AMP 201360-2-ND -J to AMP 201360-2-ND - M

ANTENNA

The antenna shall be the low profile type, and shall adhere to the cabinet using a factory installed double-sided waterproof acrylic foam adhesive. The coax cable shall be at least 1 meter in length and shall have a 50 Ω TNC connector on the modem end. In addition, the antenna shall meet the following requirements:

VSWR (at resonant point)	2:1 or less
Frequency	1850-1990 MHz and 824-894 MHz
Nominal Impedance	50 Ω
Gain	2 dB
Radiation Pattern	Omni-directional
Polarization	Vertical
Ground Plane Required	Yes, see note below

Ground plane requirements: The antenna shall require a reflective ground plane to function properly. The required ground plane shall extend beyond the antenna at least 20 cm in all directions.

10-3.20 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to Caltrans Electrical Maintenance Station, 30 Rickard Street, San Francisco, CA 94134, (415) 330-6509 and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum of 2 working days' notice shall be given prior to delivery.

10-3.21 PAYMENT

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

The contract lump sum price paid for electrical and telephone service connections shall include full compensation for furnishing all labor, materials (except items covered by other bid items), tools, equipment, and incidentals, and for doing all the work involved in installing electrical and telephone service connections, complete in place, including all testing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

The contract unit price paid for the additional equipment as specified in these special provisions shall be paid for under separate bid items.

The contract unit price paid for each of the following items shall include full compensation for furnishing all materials, tools, equipment, and incidentals, as shown on the plans, as specified in these special provisions, and as directed by the Engineer:

1. General packet radio system (GPRS) wireless modem assembly.

SECTION 10-4. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS (COUNTY)

10-4.01 DESCRIPTION

Signal and lighting (County) shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

10-4.02 TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEM (COUNTY)

SCHEDULE OF WORK

No on-site above ground signal equipment shall be installed until the Contractor has received all signal equipment, installed all conduits runs and set pull boxes to grades.

10-4.03 CONTROLLER ASSEMBLY

The following describes the minimum auxiliary equipment operational capabilities which shall be furnished and installed by the Contractor in the controller cabinet assembly:

The Contractor shall provide two convenience receptacles. Convenience receptacles shall conform to Section 86-3.05B, "Convenience Receptacle" of the Standard Specifications. The convenience receptacles shall have a ground-fault circuit interruption as defined in the National Electric Code. One receptacle shall be located in the auxiliary panel and one shall be placed in a location in the cabinet for the master modem communications.

10-4.04 PEDESTRIAN PUSH BUTTONS

Pedestrian push buttons shall conform to the provisions in Section 86-5.02, "Pedestrian Push Button Assemblies," of the Standard Specifications and these special provisions.

Pedestrian push button housings shall be metal, one piece non-adjustable type B. Assembly hardware shall be stainless steel. Button shall be ADA style DCD model or approved equal.

Pedestrian push button signs shall be the international symbol type as shown on sheet ES-5C of the Standard Plan and 125 mm x 175 mm in size.

10-4.05 FUSED SPLICE CONNECTORS

Splice connector fuse current ratings shall be as shown on State Standard Plan ES-13A except that the minimum current rating shall be 10 amperes.

10-4.06 SIGNAL FACES AND SIGNAL HEADS

Signal faces, signal heads, and auxiliary equipment, as shown on the plans, and the installation thereof, shall conform to the provisions in Section 86-4, "Traffic Signal Faces and Fittings," of the Standard Specifications and these special provisions.

Mast arm mounted signal faces shall be mounted and oriented in a manner that will make them visible to approaching traffic 305 meters in advance of the intersection.

Far-side right signal faces shall be mounted and adjusted to face the center of approaching traffic at the limit line. Near-side right and far-side left signal faces shall be mounted and adjusted to face the center of approaching traffic 60 meters in advance of the limit line. Location and orientation of signal faces shall be approved by the Engineer prior to drilling of standards.

10-4.07 LUMINAIRES

Lighting shall conform to the provisions in Section 86-6, "Lighting," of the Standard Specifications and these special provisions.

Ballasts shall be the lag or lead regulator, non-regulating reactor, 200 watts autotransformer, or high reactance type. The luminaires shall be 120/240 volt multitap, cobra style, Type III, medium cut off, high pressure sodium luminaires.

10-4.08 FOUNDATIONS

Foundations shall conform to the provisions in Section 86-2.03, "Foundations," of the Standard Specifications and these special provisions.

Portland cement concrete shall conform to Section 90-10, "Minor Concrete," of the Standard Specifications and shall contain not less than 280 kilograms of cement per cubic meter, except that concrete for reinforced pile foundations shall contain not less than 335 kilograms of cement per cubic meter.

Where signal standards are removed and abandoned or salvaged from existing foundations and will not be replaced, the top of the foundation including bolts shall be removed to a depth of not less than 300 millimeters or 300 millimeters below the grading plane, whichever is greater, and backfilled with material to match surrounding areas.

10-4.09 CONDUIT

Conduit shall conform to the provisions in Section 86-2.05, "Conduit," of the Standard Specifications and these special provisions.

All conduit for use on this project shall be of rigid metallic type unless otherwise indicated on the plans or drawings. Rigid metal conduit to be installed shall not be used as a drilling or jacking rod. The use of a line boring machine to install galvanized steel conduit is prohibited, due to its non-linear path and frictional galvanizing removal.

The ends of conduit entering or ending at a pull box, controller cabinet, or service cabinet shall be sealed with an approved duct sealing compound after conductors have been installed.

All conduit shall be cleaned with a mandrel or wire brush and blown out with compressed air prior to the installation of any conductors.

Insulated metal threaded bonding bushings will be required on metal conduit. Slip or compression couplings or bushings are not allowed.

In addition to the requirements of Section 86-2.05, "Conduit," of the Standard Specifications, conduit shall be installed in accordance with State of California Electrical Safety Orders (ESO). Conduit joints and connections shall be watertight and rustproof by an application of an approved non-insulating thread compound.

Conduit threads and damaged conduit surfaces shall be painted either with high zinc dust content paint conforming to the requirements of Military Specification MIL-P-21035 or with primer conforming to the provisions of Section 91 "Paint," of the Standard Specifications, except that the paint shall not be thinned.

At locations where conduit is to be installed by jacking or drilling as provided in Section 86-2.05C, "Installation," of the Standard Specifications, conduit may be installed, if approved by the Engineer, under the following specifications:

Alameda County does not allow trenches to be unfilled or left open overnight - no exceptions. All excavated areas in the pavement shall be backfilled, except for the top 1 inch/30 millimeters, by the end of each work period.

Conduit shall be placed under existing pavement in a trench approximately (2 inches) 50 millimeters wider than the outside diameter of the conduit to be installed. Trench width shall not exceed 150 millimeters,

The outline of all areas of pavement to be removed shall be cut to a minimum depth of 75 millimeters with an abrasive type saw or with a rock cutting excavator specifically designed for this purpose. Cuts shall be neat and true with no shatter outside the removal area.

Trench shall be backfilled with commercial quality pea gravel concrete containing not less than 335 kilograms of cement per cubic meter. The conduit shall be placed in the bottom of the trench not less than 610 millimeters below the pavement surface for asphalt surfaced roadways and 460 millimeters below the pavement surface for portland cement concrete surfaced roadways. The top (1 inch) 30 millimeters of asphalt surfaced roadways shall be backfilled with asphalt concrete produced from commercial quality paving asphalt and aggregates. Calcium chloride shall not be used in concrete which will be in contact with metal conduit.

Conduit to be installed in or under residential type driveways or in dirt areas shall be placed at a depth of not less than 1 meter. Conduit placed in planting strips or sidewalk areas shall be placed at a depth of not less than 760 millimeters.

Prior to spreading asphalt concrete, paint binder shall be applied as specified in Section 39-4.02, "Prime Coat and Paint Binder," of the Standard Specifications.

Spreading and compacting of asphalt concrete shall be performed by any method which will produce an asphalt concrete surfacing of uniform smoothness, texture, and density.

With the Engineer's approval, conduit runs shown in sidewalk areas on the plans may be placed in the street adjacent to the front edge of the curb with pull boxes located behind the curb in the paved sidewalk area.

10-4.10 PULL BOXES

Pull boxes shall conform to the provisions in Section 86-2.06, "Pull Boxes," of the Standard Specifications and these special provisions.

Drain rock shall be 38 millimeters river run flat rock. It shall be debris and dirt free before placement in pull boxes. Sump shall extend outside box by not less than 150 millimeters.

Recesses for suspension of ballasts will not be required.

Pull box lids shall have a non-slip diamond texture with I.D. specifying use.

Spacing between pull boxes shall not exceed 30 meters unless otherwise indicated on the plans or directed by the Engineer.

Grout and roofing paper in bottom of pull boxes will not be required.

All pull boxes shall be of precast reinforced concrete and have covers with polyurethane caps with brass hold downs.

Service pull box at base of service pole shall be #5 and shall have a lid which designates "SERVICE."

Where the sump of an existing pull box is disturbed by the Contractor's operation, the sump shall be reconstructed. If the sump was grouted, the old grout shall be removed and new grout placed.

Pull boxes are not to be installed outside of the County, State or City right of way. All pull boxes shall be placed either 50 millimeters off back of curb or 50 millimeters from the rear of walkways. At no time shall pull box have less than fifty millimeter of concrete at any surface point. Pull boxes shall not be placed in the center of walkways. Pull boxes shall not be placed within or in front of any proposed or existing driveway or within or in front of the pedestrian ramps for the handicapped unless otherwise directed by the Engineer.

Pull boxes located within a driveway or in a traveled way, or as directed by the Engineer, shall conform to sheet ES-8 of the Standard Plans for Traffic Pull Box.

Pull boxes located outside of an existing concrete area, in dirt or within a planter strip or island, shall be set with a concrete cap which shall extend 150 millimeters on all outside surface areas, with a minimum thickness of 100 millimeters.

10-4.11 CONDUCTORS AND WIRING

Conductors and wiring shall conform to the provisions of Section 86-2.08, "Conductors," and Section 86-2.09, "Wiring," of the Standard Specifications and these special provisions.

Aluminum conductors shall not be substituted for copper conductors.

Conductors shall be spliced by the use of "C" shaped compression connectors as shown on Standard Plan ES-13. All splices and connections are soldered.

Unless otherwise specified, signal interconnect cable (SIC) shall be 6 twisted pair, No. 19 gauge solid conductor, IMSA #20-2 cable.

Splices shall be insulated by "Method B" as shown on sheet ES-13 of the Standard Plans. Wiring for the main and auto flashing switch mounted on controller cabinet door shall be adequate to carry full system load.

Terminal strips in pole-mounted signal terminal compartments shall be 12-terminal barrier type with two #10 screws per terminal which will accommodate not less than three spade-type lugs on each screw.

Conductors No. 8 AWG and larger shall be stranded.

The first paragraph in Section 86-2.08B, "Multiple Circuit Conductors," of the Standard Specifications is amended to read:

Conductors for traffic signal, flashing beacon and multiple lighting installations shall be UL listed and rated for 600-volt operation. The insulation for No.16 AWG or smaller conductors shall be Type TF. The insulation for No. 14 AWG and larger conductors shall be one of the following:

- A. Type TW polyvinyl chloride conforming to the requirements of ASTM Designation D2219.
- B. Type THW polyvinyl chloride.
- C. Type USE, Type RHH, or Type RHW cross-linked polyethylene.

Minimum thickness of any of the above insulations shall be 1 millimeter for conductor sizes No. 14 to No. 10 AWG, inclusive, and 1.4 millimeter for No. 8 to No. 2 AWG, inclusive.

Conductors shall be permanently identified with regard to function. Identification shall be placed on each conductor, or each group of conductors comprising a signal phase, in each pull box and near the end of terminated conductors.

Identification shall be by direct labeling, tags or bands fastened to the conductors in such a manner that they will not move along the conductors. Labeling shall be by mechanical methods to produce an embossed or engraved surface.

No conductors shall be installed until all pull boxes are set to grade and drain rock installed. A pull wire shall be used in lieu of rope.

Mast arm signal equipment shall be wired and spliced to nearest pull box. Jumpers in poles are not allowed, this is for all wire including neutrals and grounds .

10-4.12 REMOVING, REINSTALLING, OR SALVAGING ELECTRICAL EQUIPMENT & CONDUCTORS

Removing, reinstalling, or salvaging electrical equipment shall conform to the provisions in Section 86-7, "Removing, Reinstalling or Salvaging Electrical Equipment," of the Standard Specifications.

At the discretion of the Engineer, existing cables and/or conductors shown on the plans to be removed and not reused or salvaged shall become the property of the Contractor and shall be removed from the roadway right of way in accordance with the provisions in Section 7-1.13, "Disposal of Materials Outside the Highway Right of Way", except that written permission from the Engineer for disposal of material will not be required or salvaged electrical materials shall be hauled to the Alameda County Corporation Yard No. 4 located at 951 Turner Court, Hayward, CA, and stockpiled. The Contractor shall provide equipment as necessary, to safely unload and stockpile the material. A minimum of two working days notice shall be given prior to delivery.

10-4.13 BONDING AND GROUNDING

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Grounding to existing water systems will not be permitted.

Grounding jumper shall be attached by a 5 millimeter or larger brass bolt in the signal standard or controller pedestal and shall be run to the conduit, ground rod or bonding wire in adjacent pull box. The grounding jumper shall be visible after the cap has been poured on the foundation.

10-4.14 VEHICLE DETECTORS

Vehicle detectors shall conform to the provisions in Section 86-5.01, "Vehicle Detectors," of the Standard Specifications and these special provisions. Vehicle detectors shall be inductive loop detectors as indicated on the construction drawings.

Loop wire shall be Type 1. Loop detector lead-in cable shall be Type B.

The number of inductive loop detectors and lead-in cables required to achieve the specified vehicle detection shall be installed.

Output relays, if used, shall be normally closed.

Sensor units shall be Type A .

A maximum of 4 conductors shall be installed in any one sawed slot.

The Contractor shall not saw any slots for loops until the Engineer has approved the Contractor's detailed drawing showing all saw slot routings and pull box locations. Only approved saw slot routings shall be installed.

Detector loop installation shall commence after all roadway repair work has been completed. On new pavements, detector loop saw cutting, installation, and testing shall occur prior to the installation of the final roadway surfacing.

Orientation of the loop detector sensor unit shall have no effect on the operation of the unit.

In addition to the installation notes, details and tests indicated on Sheets ES-5A and ES-5B of the Standard Plans, the following shall apply:

The number of turns in detector loops shall conform to the detector manufacturer's recommendations.

Where two or more individual loops are to be connected to the same sensor unit, they shall be connected in accordance with the sensor manufacturer's recommendations, and to the satisfaction of the Engineer for required loop sensitivity.

Loop lead-in cable from the first pull box to the controller cabinet shall be tagged with the identity of all conductor loops connected to the circuit.

Conductors buried in the pavement may be installed only in the presence of the Engineer.

The Contractor shall install conductor loop wires and place the required sealant on the same day that saw slots to the nearest pull box, and holes are cut in the road surface for these installations.

The Contractor shall insure compatibility of each inductive loop sensor and its associated loop lead-ins and loops, and shall insure and prove to the satisfaction of the Engineer that the combined system will provide consistent and stable operation and be unaffected by input voltage variations of plus or minus 10 percent, common electric and magnetic disturbances, flooding of cable with water, and normal range of temperature, humidity and other weather and climatic conditions. Any deviation from insuring such compatibility shall be approved by the Engineer prior to installation.

In lieu of the requirement in the fourth paragraph of Section 86-5.01A(5), "Installation Details," of the Standard Specifications, slots in asphalt concrete pavement shall be filled as follows:

After conductors are installed in the slots cut in the pavement, paint binder shall be applied to all vertical surfaces of slots in accordance with the provisions of Section 94, "Asphaltic Emulsions," of the Standard Specifications. The slots shall then be filled with asphaltic sealant as approved by the Engineer.

Temperature of sealant material during installation shall be above 21 degrees Celsius. Air temperature during installation shall be above 10 degrees Celsius. Sealant placed in the slots shall be compacted by use of an 200 millimeter diameter by 3 millimeter thick plastic hand roller or other tool approved by the Engineer. Compacted sealant shall be flush with the pavement surface. Minimum conductor coverage shall be 16 millimeter. Excess sealant remaining after rolling shall not be reused. Traffic may be released immediately over compacted material.

Prior to filling wire slots with sealant, a vehicle performance check, in lieu of the requirements of the Standard Specifications, shall be performed for each inductive loop installation as designated on the construction drawings.

- A. Conductor loops shall be installed, soldered connections made, and circuits completed through amplifier to controller, and system energized, without filling the pavement slots and holes with sealant.
- B. The test vehicle, which shall be furnished by the Contractor, shall be a standard 0.7 meter aluminum STOP sign panel.
- C. The test vehicle shall be detected continuously across 2.5 meter of lane width at all conductor loop locations for at least three (3) minutes.
- D. Inductive loop detector sensors controlling extension type detection, as designated on the construction drawings shall signal continually the presence of any vehicle within the required 2.5 meter lane width until the vehicle leaves the area of detection, whereupon the vehicle call shall drop after an extension which shall be adjustable from 0.5 seconds to 7.5 seconds, minimum. Should a vehicle enter the detection area during the timed extension period, the extension timer shall reset to zero and begin timing the extension period when this vehicle leaves the detection area.
- E. Upon successful completion of the above test to the satisfaction of the Engineer, the Contractor shall fill the wire slots with sealant and repeat the test to the satisfaction of the Engineer.

If the Engineer approves, the Contractor may place the conductor loops and sealant prior to testing and prior to field installation of the controller cabinet.

All head and bike loops shall be of the Type D vehicle loop design.

10-4.15 FUNCTIONAL TESTING

Testing shall conform to the provisions in Section 86-2.14, "Testing," of the Standard Specifications and these special provisions.

Where the inductive loop detector conductors are to be installed/replaced in an area that is to be resurfaced with asphalt concrete, the loop detector conductors shall be placed in slots cut in the existing pavement. The conductors shall be installed/replaced as shown on the plans. Testing of the detector loops shall conform to the requirements of Section 86-2.14B, "Field Testing," of the Standard Specifications.

Section 86-2.14C, "Functional Testing," of the Standard Specifications is modified to read as follows:

A functional test shall be made to demonstrate that each and every part of the system functions as specified or intended herein prior to returning the signal to its normal daily operation.

Field wiring and signal phases shall be tested by individual color display, phase by phase, prior to full connection of all field wiring and system operation.

The functional test for the traffic signal system shall consist of not less than five (5) days of continuous satisfactory service. The functional test shall not begin until the entire installation is complete and in place, to include signal face alignment, in accordance with all requirements of the plans, these special provisions, the Standard Plans and the Standard Specifications, to the satisfaction of the Engineer. The 5-day functional test shall be conducted with all signal faces completely covered with cardboard or other Engineer approved material. The Contractor shall insure that light is not visible from any signal face at all times.

During the five-day test period, County forces will maintain the signal system. The cost of any maintenance or repair necessary, except electrical energy, shall be deducted from any monies due or to become due to the Contractor.

The Contractor shall give five (5) days notice to the Engineer prior to turning on any equipment. The Contractor shall also insure that a qualified service representative and/or representative of the manufacturer and/or manufacturers familiar with the equipment installed, shall be present at the time the equipment is turned on. The representative shall remain at the controller until it has been demonstrated that his portion of the control equipment functions as intended in the plans, as required in the Specifications, and to the satisfaction of the Engineer. If an authorized manufacturer's representative of any portion of the control equipment is not present at the time indicated by the Contractor or fails to show that his equipment operates as intended, the functional test will be discontinued and postponed until such time as the above stipulations can be met.

If unsatisfactory performance of the system develops, the conditions shall be corrected and the test shall be repeated until the 5 days of continuous satisfactory performance is obtained.

Tests shall start prior to 10:00 a.m., but shall not start on a Thursday, Friday or on any second or first day preceding a holiday.

A shutdown of the electrical system resulting from damage caused by public, traffic, or from a power interruption or from unsatisfactory performance of County-furnished materials shall not constitute discontinuity of the functional test.

Upon successful completion of the 5-day field test, throughout the remainder of the construction period and during the guarantee period, the Contractor shall replace or repair defective parts or equipment within 72 hours of being notified of such defective condition and provide such maintenance and repair assistance to the County as may be reasonably necessary. Spare parts for equipment supplied by the County are available from the Alameda County Corporation Yard No. 4 at 951 Turner Court, Hayward, CA. (510/670-5500).

10-4.16 PAYMENT

The contract lump sum price paid for Signal and Lighting (County) shall include full compensation for furnishing all labor, materials (except items covered by other bid items), tools, equipment, and incidentals, and for doing all the work involved in installing Signal and Lighting (County), complete in place, including all testing, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

SECTION 11. (BLANK)

SECTION 12. BUILDING WORK

SECTION 12-1. GENERAL REQUIREMENTS

12-1.01 SCOPE

Building work described herein and as shown on the plans shall conform to the requirements of these special provisions and Sections 1 through 9 of the Standard Specifications. Sections 10 through 95 of the Standard Specifications shall not apply to the work in this Section 12 except when specific reference is made thereto.

The building work to be done consists, in general, of construction of a new maintenance facility for the State of California Department of Transportation in Alameda County. Work includes construction of a single story office/shop building and an equipment storage building, and related site development. The work includes, but is not limited to the following:

- Building concrete foundations and concrete slab work, including requisite earthwork.
- Structural steel framing.
- Reinforced concrete masonry unit work.

Concrete tilt-up construction.

Doors and windows.

Interior finishes, including metal framing with gypsum board, ceramic tile, resilient flooring, acoustical ceilings, and paint.

Plumbing, including fixtures and specialties.

Heating and cooling systems.

Electrical system and building controls.

Site development, including asphalt paving, chain-link fencing and gates, landscaping and landscape irrigation, underground utilities, site drainage, and requisite earthwork (see Standard Specifications).

12-1.02 ABBREVIATIONS

Section 1-1.02, "Abbreviations," of the Standard Specifications is amended by adding the following:

AAMA	American Architectural Manufacturers' Association
ACI	American Concrete Institute
AGA	American Gas Association
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association
APA	American Plywood Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
CBC	California Building Code
CEC	California Electrical Code
CMC	California Mechanical Code
CS	Commercial Standards (US Department of Commerce)
ESO	Electrical Safety Orders
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specification
ICBO	International Conference of Building Officials
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board Fire Underwriters
NEC	National Electrical Code
NFPA	National Fire Protection Association
PEI	Porcelain Enamel Institute
PS	Product Standard (US Department of Commerce)
RIS	Redwood Inspection Service
SCPI	Structural Clay Products Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	Steel Structures Paint Council
TCA	Tile Council of America
TPI	Truss Plate Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau (stamped WCLB)
WCLB	Grade stamp for WCLIB
WIC	Woodwork Institute of California
WWPA	Western Wood Products' Association

When reference is made to the Uniform Building Code (UBC) on the plans or in the special provisions, it shall be the 1997 Uniform Building Code as amended by the 1998 Title 24 California Building Standards Code.

12-1.03 GUARANTEE

The Contractor hereby unconditionally guarantees that the building work will be done in accordance with the requirements of the contract, and further guarantees the building work of the contract to be and remain free of defects in workmanship and materials for a period of one year from the date of acceptance of the contract, unless a longer guarantee period is required elsewhere in these special provisions. The Contractor hereby agrees to repair or replace any and all building work, together with any other adjacent work which may be displaced in so doing, that may prove to be not in

accordance with the requirements of the contract or that may be defective in its workmanship or material within the guarantee period specified, without any expense whatsoever to the Department, ordinary wear and tear and unusual abuse or neglect excepted.

The performance bond for contract price of the building work, shall remain in full force and effect during the guarantee period.

The Contractor further agrees, that within 10 calendar days after being notified in writing by the Department of any building work not in accordance with the requirements of the contract or any defects in the building work, he shall commence and prosecute with due diligence all work necessary to fulfill the terms of this guarantee, and shall complete the work within a reasonable period of time, and, in the event he fails to comply, he does hereby authorize the Department to proceed to have such work done at the Contractor's expense and he shall honor and pay the cost and charges therefor upon demand. The Department shall be entitled to all costs and expenses, including reasonable attorney's fees, necessarily incurred upon the Contractor's refusal to honor and pay the above costs and charges.

12-1.04 SUBMITTALS

Working drawings, material lists, descriptive data, samples and other submittals specified in these special provisions shall be submitted for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications and these special provisions.

Unless otherwise permitted in writing by the Engineer, all submittals required by these special provisions shall be submitted within 35 days after the contract has been approved.

Attention is directed to the provisions in Section 5-1.01, "Authority of Engineer," of the Standard Specifications. The Engineer may request submittals for materials or products where submittals have not been specified in these special provisions, or may request that additional information be included in specified submittals, as necessary to determine the quality or acceptability of such materials or products.

Attention is directed to Section 6-1.05, "Trade Names and Alternatives," of the Standard Specifications. The second indented paragraph of the first paragraph of said Section 6-1.05 is amended to read:

Whenever the specifications permit the substitution of a similar or equivalent material or article, no test or action relating to the approval of such substituted material will be made until the request for substitution is made in writing by the Contractor accompanied by complete data as to the equality of the material or article proposed. Such request shall be made within 35 days after the date the contract has been approved and in ample time to permit approval without delaying the work, but need not be made in less than 35 days after award of the contract.

Work requiring the submittal of working drawings, material lists, descriptive data, samples, or other submittals shall not begin prior to approval of said submittal by the Engineer. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

Submittals shall be delivered to the locations indicated in these special provisions. If a specific location is not indicated, the submittal shall be delivered to the Division of Structure Design, Documents Unit, Fourth Floor, Mail Station 9-4/4I, 1801 30th Street, Sacramento, California 95816, telephone (916) 227-8252, or the submittals shall be mailed to the Division of Structure Design, Documents Unit, Mail Station 9-4/4I, P. O. Box 942874, Sacramento, California 94274-0001.

Each submission of drawings, material lists and descriptive data shall consist of at least 5 copies. Two copies will be returned to the Contractor either approved for use or returned for correction and resubmittal.

Each separate item submitted shall bear a descriptive title, the name of the project, district, county, and contract number. Plans and detailed drawings shall be not larger than 559 mm x 914 mm.

The material list shall be complete as to name of manufacturer, catalog number, size, capacity, finish, all pertinent ratings, and identification symbols used on the plans and in the special provisions for each unit.

Parts lists and service instructions packaged with or accompanying the equipment installed in the work shall be delivered to the Engineer at the job site. Required operating and maintenance instructions shall be submitted in triplicate.

Manufacturer's warranties for products installed in the work shall be delivered to the Engineer at the jobsite.

Unapproved samples and samples not incorporated in the work shall be removed from State property, when directed by the Engineer.

12-1.05 PROGRESS SCHEDULE

A progress schedule shall be submitted in duplicate for the building work in accordance with the requirements in Section 8-1.04, "Progress Schedule," of the Standard Specifications.

12-1.06 SCHEDULE OF VALUES

The Contractor shall prepare and submit to the Engineer for approval 2 copies of a Schedule of Values within 15 working days of approval of the contract covering each lump sum item for building work. Fifteen working days shall be allowed for approval or return for correction of each submittal or resubmittal. Should the Engineer fail to complete his review within the time specified and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in review, an extension of time commensurate with the delay in completion of the work thus caused will be granted as provided in Section 8-1.07, "Liquidated Damages," of the Standard Specifications.

The Schedule of Values must be accurately divided into sections representing the cost of each separate building or structure. All work that is not part of a separate building or structure, such as excavation, grading, curbs, gutters, sidewalks, paving, sewer and storm drainage and utility distribution lines are to be included under a specific section as General Work and not included in the building or structure cost. Indirect costs and general condition items are to be listed as a separate line item of work. The sections representing each building or structure must be identified as to the building or structure they represent and be broken down to show the corresponding value of each craft, trade or other significant portion of the work. A sub-total for each section shall be provided.

The Schedule of Values shall be approved by the Engineer before any partial payment estimate is prepared.

The sum of the items listed in the Schedule of Values shall equal the contract lump sum price for building work. Overhead, profit and bond premium are to be appropriately distributed across all line items of cost.

12-1.07 INSPECTION

All items covered or all stages of work that are not to remain observable must be inspected and approved before progress of work conceals portions to be inspected. The Contractor shall notify the Engineer not less than 72 hours in advance of when such inspection is needed.

12-1.08 OBSTRUCTIONS

Attention is directed to Sections 7-1.11, "Preservation of Property," 7-1.12, "Responsibility for Damage," 7-1.16, "Contractor's Responsibility for the Work and Materials," and 8-1.10, "Utility and Non-Highway Facilities," of the Standard Specifications.

The Contractor shall notify the Engineer and the appropriate regional notification center for operators of subsurface installations at least 5 working days prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include but are not limited to the following:

Underground Service Alert
Northern California (USA)
Telephone: 1(800)642-2444

Underground Service Alert
Southern California (USA)
Telephone: 1(800)422-4133

South Shore Utility
Coordinating Council (DIGS)
Telephone: 1(800)541-3447

Western Utilities
Underground Alert, Inc.
Telephone: 1(800)424-3447

12-1.09 UTILITY CONNECTION

The Contractor shall make all arrangements, and obtain all permits and licenses required for the extension of and connection to each utility service applicable to this project, shall furnish all labor and materials necessary for such extensions which are not performed or provided by the utility, and shall furnish and install any intermediate equipment required by the serving utilities.

Upon written request by the Contractor, the State will pay all utility permits, licenses, connection charges, and excess length charges directly to the utility. Such request shall be submitted not less than 45 days before service connections are required.

The costs incurred by the Contractor for the extensions of utilities beyond the limits shown on the plans, and in furnishing and installing any intermediate equipment required by the serving utilities, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Full compensation for any costs incurred by the Contractor to obtain the permits and licenses shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

12-1.10 TEMPORARY UTILITIES

The Contractor may obtain electrical power and water from existing State electrical power and water outlets within the contract limits free of charge for contract operations where such utilities exist, provided that such utility services are in service and are not required by the State for other purposes and subject to the provisions in the section "Cooperation" of these special provisions.

The Contractor shall make his own arrangements to obtain any additional electrical power and water or other utilities required for his operations and shall make and maintain the necessary service connections at his own expense.

When existing utility systems are being modified, periods of shutdown will be determined by the Engineer.

The Contractor shall provide adequate temporary lighting to perform the work and allow the Engineer to inspect the project as each portion is completed.

The Contractor shall provide and pay for telephone service he may require. State telephone facilities shall not be used.

12-1.11 SANITARY FACILITIES

The Contractor shall provide and pay for wash facilities, and drinking water fixtures. Facilities shall include the periodic flushing, waste removal and cleaning of such facilities. Units shall to be maintained in a clean and sanitary condition, including a supply of toilet tissue, toilet seat covers, paper towels and paper cups. Waste material shall be disposed of off site in a lawful manner. Temporary toilet units shall be single occupant units of the chemical type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

12-1.12 REFERENCES

When reference is made to the Uniform Building Code (UBC) on the plans or in the special provisions, it shall be the 1997 Uniform Building Code as amended by the 1998 Title 24 California Building Standards Code.

12-1.13 MEASUREMENT AND PAYMENT

The contract lump sum price paid for building work shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the building work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for any incidental materials and labor, not shown on the plans or specified, which are necessary to complete the buildings and appurtenances shall be considered as included in the contract lump sum price paid for building work and no additional compensation will be allowed therefor.

12-1.14 PROJECT RECORD DRAWINGS

The Contractor shall prepare and maintain one set of project record drawings, using an unaltered set of original project plans, to clearly show all as-constructed information for the project. As a minimum, the information to be shown shall include 1) any plan clarifications or change orders, 2) locations of any underground utilities, or 3) the location, size, type, and manufacturer of all major products or components selected by the Contractor for use in the work.

All markings shall be placed on the project record drawings using red ink or red pencil. Original figures shall not be eradicated nor written over and superseded material shall be neatly lined out. Additional drawings shall be submitted if the required information cannot be clearly shown on the original set of project plans. The additional drawings shall be not less than 279 mm x 432 mm in size and shall have the contract number on each sheet. The Contractor shall sign and date each sheet of the project record drawings to verify that all as-constructed information shown on the drawings is correct.

The Contractor shall periodically review the set of project record drawings with the Engineer during the progress of the work to assure that all changes and other required information are being recorded.

Before completion of the work, the Contractor shall request a review of the project record drawings to determine the completeness and adequacy of them. If the project record drawings are unacceptable, the Contractor shall inspect, measure, and survey the project as necessary to record the required additional information.

The set of completed project record drawings shall be delivered to the Engineer prior to acceptance of the contract.

SECTION 12-2. SITEWORK

12-2.01 EARTHWORK FOR BUILDING WORK

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of performing earthwork for building work in accordance with the details shown on the plans and these special provisions.

Earthwork for building work shall consist of structure excavation and structure backfill. Structure excavation shall include excavation for footings, foundations, walls, slabs and trenches. Structure backfill shall include backfilling under slabs; backfilling under and around footings; backfilling for walls, and backfilling for pipes and conduits.. In addition to structure excavation and structure backfill, earthwork for building work shall include any other earthwork, not mentioned, but necessary to complete the building work.

Attention is directed to the Materials Information Handout for information regarding foundation recommendations and reports that were prepared for use during the design of this project.

QUALITY ASSURANCE.--

Samples.--Samples of sand or crushed stone, weighing not less than 11 kg, shall be submitted to the Engineer at the jobsite for approval.

SITE CONDITIONS.--

Existing underground piping and conduit.--The location of existing underground piping and conduit is based on the best records available. Before beginning work, the Contractor shall accurately locate the piping and conduit involved in the work. If the location of the existing piping or conduit deviates from the location shown on the plans by more than 1.5 meters, or, if no elevations are indicated and the piping or conduit is more than 0.9 meter below grade, the cost of the additional excavation, backfill, piping or conduit, and removal and replacement of concrete, if any, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

PART 2.- PRODUCTS

BACKFILL MATERIALS.--

Structure backfill.--

Structure and trench backfill shall consists of select, non-expansive granular material, free of organic and other deleterious material and shall be suitable for the required compaction. Gravel without sand matrix shall not be used except as free draining granular material beneath slabs and footings.

Sand.--

Sand shall be clean, washed sand, free from clay or organic material graded such that 100 percent passes the 6 mm sieve, 90 percent to 100 percent passes the 4.75 mm sieve and not more than 5 percent passes the 75 μ m sieve size.

Crushed stone.--

Crushed stone shall be clean, washed, dry density of not less than 1522 kg/m³, crushed stone or crushed gravel with an angular particle size not less than 3 mm or more than 13 mm.

Sieve or Screen Size	Percentage Passing
13 mm	100
9.5 mm	85-100
4.75 mm	10-30
2.36 mm	0-3

Crushed stone shall conform to the following requirements:

Test	California Test No.	Test Requirements
Durability Index	229	35 Min.

PART 3.- EXECUTION

PREPARATION & RESTORATION.--

Sawcutting.--Prior to excavation or trenching, existing surfacing shall be removed to saw cut lines. The saw cut shall be to a neat line and have a depth not less than 25 mm.

Restoration.--Surfacing shall be replaced to match the thickness, grades and finish of the adjacent surrounding surfaces.

STRUCTURE EXCAVATION.--

General.--Unless otherwise noted, all excavation for building work shall be classified as structure excavation.

Footing excavation.--The bottom of excavation shall not be disturbed. The Contractor shall excavate by hand to the final grade. The bottom of concrete footings shall be poured against undisturbed material. Unless otherwise noted, compaction of the bottom of footing excavation is not required unless the material is disturbed. The footing depths shown on the plans shall be changed to suit field conditions when directed by the Engineer. Solid rock at or near required depths shall not be disturbed. Unsuitable material shall be excavated down to firm bearing as directed by the Engineer. Work and materials required because of excavation in excess of the depths shown on the plans, when such excavation has been ordered by the Engineer, will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications.

Excavate to the elevations and dimensions within a tolerance of ± 12 mm. Limits of the excavation shall allow for adequate working space for installing materials and as required for safety of personnel. Such working space excavation shall be replaced in kind and compacted at the Contractor's expense.

Overdepth excavation for footings shall be backfilled with concrete or such other material recommended by the Contractor and approved by the Engineer. Relative compaction shall be not less than 95 percent.

At locations and to the limits shown on the plans, material below the bottom of the foundation or footing shall be removed and replaced with structure backfill in accordance with the placing and compacting requirements for backfill.

Excavation for pipes and conduits.--Pipes or conduits in the same trench shall have a minimum clear distance between pipes or conduits of 150 mm. Pipes or conduits shall have not less than 0.75 meter of cover from top of pipes or conduits to finished grade unless otherwise shown on the plans or specified.

Trenching shall be of sufficient depth to permit placing a minimum depth of 100 mm of compacted sand under all pipes and conduits.

Excavation adjacent to trees shall be performed by hand methods where necessary to avoid injury to trees and roots. Roots 50 mm in diameter and larger shall be protected with heavy burlap. Roots smaller than 50 mm in diameter adjacent to trees shall be hand trimmed. Cuts through roots 13 mm in diameter and larger shall be sealed with tree trimmers' asphaltic emulsion. If trenches remain open more than 24 hours, the side of the trench adjacent to the tree shall be shaded with burlap and kept damp. Materials shall not be stockpiled within the drip line of trees.

Dewatering.--Excavations shall be kept clear of standing water. Water shall be removed by pumping if necessary. Water removed from excavation shall be carried away from the building site and disposed of in a manner that will not harm State or adjacent property.

STRUCTURE BACKFILLING.--

General.--Unless otherwise noted, all backfill for building work shall be classified as structure backfill. Backfill shall be placed and compacted in horizontal layers, not more than 102 mm thick prior to compaction, and to the lines and grades shown on the plans or to original ground.

Structure backfill.--After structures are in place and forms are removed, wood and other debris shall be removed from excavations before placing structure backfill.

Backfilling pipes and conduits.--Backfill placed under pipe and conduits shall be compacted sand, 100 mm minimum depth. Backfill material placed to a level 150 mm above tops of pipes and conduits shall be sand or fine earth and particles shall not exceed 13 mm in greatest dimension. For wrapped, coated, or plastic pipe or conduits, sand shall be used for backfill. Backfill material placed higher than 150 mm above tops of pipes or conduits shall consist of material free of stones or lumps exceeding 100 mm in greatest dimension except:

- (a) The top 300 mm of backfill under roads, walks or paving shall consist of aggregate base material.
- (b) The top 150 mm of backfill in planted areas shall consist of topsoil.

Unless otherwise shown on the plans, pipe under roads, with less than 0.75 m of cover over the top of pipe, shall be backfilled with concrete to a level 100 mm above the top of pipe. Concrete for backfill shall be commercial quality concrete containing not less than 350 kg/m³ of cement.

COMPACTION.--

General.--Relative compaction shall be determined in accordance with California Test 216 or 231. Unless otherwise noted below, all backfill shall be compacted to a minimum relative compaction of 90 percent. Unless approved in writing by the Engineer, compaction by jetting or ponding will not be permitted.

Compact original ground.--Original ground surface under fill with surfacing of concrete and asphalt concrete shall be compacted to a relative compaction of not less than 95 percent for a minimum depth of 150 mm.

Subgrade preparation.--Preparation of subgrade material for placing aggregate base, surfacing, or slabs thereon shall include fine grading, compaction, reworking as necessary. The upper 150 mm of the subgrade shall have the same compaction as the fill to be placed over it.

The prism of backfill directly underneath the building foundation and sloping downward at 1:1 shall be compacted to 95 percent.

Structure backfill.--Structure backfill shall be compacted to not less than 95 percent relative compaction with a moisture content of within 3 percent of optimum, up to the planned finish grade elevation.

A relative compaction of not less than 95 percent shall be obtained for a minimum depth of 150 mm below the bottom of the excavation before placing select backfill.

Trench backfill.--Trench backfill placed beneath slabs or paved areas shall be compacted to a relative compaction of not less than 95 percent.

DISPOSAL.--

Surplus material.--Surplus material from the excavation shall be removed and disposed of outside the right-of-way in accordance with Section 7-1.13 of the Standard Specifications.

FIELD QUALITY CONTROL.--

Inspection.--When the excavation is substantially completed to grade, the Contractor shall notify the Engineer. No concrete shall be placed until the foundation has been approved by the Engineer.

Testing.--The State will conduct compaction tests during the backfilling and compacting operations.

12-2.02 AGGREGATE BASE

PART 1.-GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing, spreading and compacting aggregate base in accordance with the details shown on the plans and these special provisions.

PART 2.-PRODUCTS

Aggregate base.--

Aggregate base shall be commercial quality aggregates consisting of broken stone; crushed gravel; natural, clean, rough-surfaced gravel and sand; or a combination thereof.

Aggregate base shall conform to the following grading as determined by California Test 202:

Sieve or Screen Size	Percentage Passing
25 mm	100
19 mm	90 - 100
4.75 mm	35 - 60
600 µm	10 - 30
75 µm	2 - 9

Aggregate base shall also conform to the following quality requirements:

Tests	California Test No.	Test Requirements
Durability Index	229	35 Min.
Resistance (R-Value)	301	78 Min.
Sand Equivalent	217	22 Min.

PART 3.-EXECUTION

SPREADING AND COMPACTING.--

Spreading.--Aggregate base shall be placed and compacted to the lines and grades shown on the plans.

Spreading and compacting shall be performed by methods that will produce a uniform base, free from pockets of coarse or fine material.

Compaction.--Relative compaction of each layer of compacted base material shall be not less than 95 percent, as determined by California Test 216 or 231.

12-2.03 FREE DRAINING GRANULAR MATERIAL

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and placing free draining granular material beneath slabs in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS

Free draining granular material.--

Free draining granular material shall be clean, hard, durable, free-draining rock. The material gradation shall be such that all passes the 25 mm screen, and not more than 10 percent passes the 4.75 mm sieve as determined by California Test 202. Granular material shall be free from organic material, clay balls or other deleterious substances.

PART 3.- EXECUTION.--

SPREADING AND CONSOLIDATING.--

General.--Free draining granular material shall be placed, spread and consolidated by tamping or vibrating.

SECTION 12-3. CONCRETE AND REINFORCEMENT

12-3.01 CAST-IN-PLACE CONCRETE

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of providing and installing cast-in-place concrete including formwork and steel reinforcement in accordance with the details shown on the plans and these special provisions.

Whenever the 28-day compressive strength shown on the plans is 21 MPa or greater, the concrete shall be considered to be designated by compressive strength. The 28-day compressive strengths shown on the plans which are less than 21 MPa, are shown for design information and are not to be considered a requirement for acceptance of the concrete.

Related work.--Compressive strength concrete shall conform to the requirements in Section 90-9, "Compressive Strength," of the Standard Specifications.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for admixtures, expansion joint material, vapor barrier, hardener, and sealer shall be submitted for approval.

Descriptive data shall be delivered to the Engineer at the jobsite.

Concrete Mix Designs--Concrete Mix Designs shall be submitted to the Engineer at the jobsite. With the mix designs shall be submitted documentation justifying the selection of concrete proportions per Sections 1905.2 and 1905.3 of the California Building Code. The mix designs will be reviewed to verify that the requirements for the concrete under "Concrete Mixes" are met.

Certificate of Compliance – Certificates of Compliance shall be submitted to the Engineer as specified under “Quality Assurance”.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for cement, reinforcement, epoxy products, and admixtures in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Special Inspection -- Special inspection for the concrete work shall be provided by the Engineer and shall conform to Sections 1701.5, 1701.6, and 1701.7 of the California Building Code.

Evaluation and Acceptance of Concrete -- Evaluation and acceptance of concrete shall be per Section 1905.6 of the California Building Code.

A sample for strength tests of each class of concrete placed each day shall be taken by the Engineer not less than once a day, or not less than once for each 115 cubic meters of concrete, or not less than once for each 465 square meters of surface area for slabs or walls. A sample shall be made from at least five batches of concrete or from each batch if fewer than five batches are used.

A sample shall consist of 3 cylinders, to be laboratory cured.

A sample shall consist of 5 test cylinders (3 to be laboratory-cured and 2 to be field-cured).

Laboratory-cured cylinders shall be cured as per ASTM C192.

Field-cured cylinders shall be cured as per ASTM C31.

For laboratory-cured test cylinders, test one cylinder at 7 days of age and two cylinders at 28 days of age. The 28-day strength shall be the average of the two tests made at 28 days.

For field cured test cylinders, test both cylinders at 28 days of age.

For laboratory-cured test cylinders, strength level of an individual class of concrete shall be considered satisfactory if both the following requirements are met:

1. Every arithmetic average of any three consecutive strength tests equals or exceeds the specified minimum f'_c .
2. No individual strength test (average of two cylinders) fall below f'_c by more than 3.45 Mpa.

All concrete not meeting the strength requirements listed above shall be rejected as defective materials unless the Contractor, at the Contractor's expense, obtains and submits evidence acceptable to the Engineer that the strength of the concrete placed in the work meets or exceeds the specified 28-day compressive strength. Investigation of low-strength test results by the Contractor shall be per Section 1905.6.4 of the California Building Code.

PART 2.- PRODUCTS

CONCRETE MIXES.--

Classes of Concrete --Each class of concrete shall be proportioned to provide the characteristics listed below.

Class A Concrete

Minimum 28-day compressive strength $f'_c = 21^\circ\text{MPa}$.

Normal weight concrete, weight = 22.8°kN/m^3 .

Minimum cement content = 350°kg/m^3 .

Maximum water/cement ratio = 0.55.

Penetration = 13mm to 38mm.

Air Content = 3 ± 1 percent.

Uses: general use, footings, slabs, columns, walls.

Class B Concrete

Minimum 28-day compressive strength $f'_c = 17.2^\circ\text{MPa}$.

Normal weight concrete, weight = 22.8°kN/m^3 .

Minimum cement content = 300°kg/m^3 .

Maximum water/cement ratio = 0.60.

Penetration = 13mm to 51mm.

Air Content = 5 ± 1 percent.

Uses: curbs, sidewalks, driveways, gutter depressions, bollards.

Class C Concrete

Minimum 28-day compressive strength $f'_c = 21$ MPa.

Normal weight concrete, weight = 22.8 kN/m^3 .

Cement Type – Type II with 15 percent by weight of mineral admixture or

Type IP (MS) Modified cement.

Minimum cement content = 350 kg/m^3 .

Maximum water/cement ratio = 0.55.

Penetration = 13mm to 38mm.

Air Content = 5 ± 1 percent.

Uses: sewer structures, vehicle washracks, and mud rinse slabs.

CONCRETE MATERIALS.--

Cement.--

Cement shall conform to ASTM Designation: C 150, Types II, or III portland cement; or Type IP (MS) Modified cement. Type IP (MS) Modified shall conform to ASTM Designation: C 595 and shall be comprised of an intimate mixture of Type II Modified cement and not more than 20 percent of a pozzolanic material.

Aggregates.--

Aggregates shall be normal weight free from deleterious coatings, clay balls and other extraneous materials conforming to ASTM C33, class 3M coarse aggregate or better, graded. Maximum aggregate size shall be 25mm nominal. Fine aggregate shall be free of materials with deleterious reactivity to alkali in cement.

Water.—water shall conform to ASTM Designation: C 94/C 94M and potable.

Admixtures.--

Admixtures used in portland cement concrete shall be included on the Department's current list of approved admixtures, and shall conform to ASTM Designation: C 494, Types A, B, D, F or G for chemical admixtures; ASTM Designation: C 260 for air-entraining admixtures; and ASTM Designation: C 618 for mineral admixtures, except loss on ignition shall not exceed 4 percent. Properties of admixtures shall be uniform in each lot.

FORM MATERIALS.--

Forms for exposed finish concrete.--

Forms for exposed surfaces shall be plywood, metal or other panel type materials. Plywood shall be not less than 16 mm thick and without scars, dents, and delaminations. Forms shall be furnished in largest practical pieces to minimize number of joints.

Plywood shall conform to the requirements of U. S. Product Standard PS-1 for Exterior B-B (Concrete Form) Class I.

Forms for edges of slabs shall be nominal 50 mm solid stock lumber, plywood, or metal forms.

Forms for unexposed finish concrete.--

Forms for unexposed finish concrete surfaces shall be plywood, lumber, metal or other acceptable material.

Forms for cylindrical columns or supports.--

Forms for cylindrical columns shall be metal, fiberglass reinforced plastic, paper or fiber tubes. Paper or fiber tubes shall be constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for protection against weather or moisture.

Form ties.--

Form ties shall be factory fabricated, removable or snapoff metal ties for use as necessary to prevent spreading of forms during concrete placement.

Form oil.--

Form oil shall be commercial quality form oil which will permit the ready release of the forms and will not discolor the concrete.

REINFORCING MATERIALS.--**Bar reinforcement.--**

Bar reinforcement shall conform to ASTM Designation: A 615/A 615M, Grade 60 [420], or ASTM Designation: A 706/A 706M.

Bar supports.--

Bar supports for reinforcement shall be precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads.

RELATED MATERIALS.--**Expansion joint material.--**

Expansion joint material shall be commercial quality asphalt impregnated pressed fiber sheets, 13 mm minimum thickness.

Vapor barrier.--

Vapor barrier shall be commercial quality polyethylene sheets not less than 0.15 mm thick.

Bond breaker.--

Bond breaker shall be Type I asphalt saturated organic felt or such other material approved by the Engineer.

Control joints.--

Control joints shall be commercial quality, preformed, T-shaped plastic strips with detachable top flange.

Keyed construction joint forms.--

Keyed construction joint forms shall be commercial quality, galvanized metal or plastic, factory fabricated construction joint forms. Forms shall produce a rabbeted key type joint.

Mortar.--

Mortar shall consist of one part cement to 2 parts clean sand and only enough water to permit placing and packing.

Curing compound.--

Curing compound shall be a non-pigmented curing compound with fugitive dye conforming to the requirements of ASTM Designation: C 309, Type 1-D, Class A.

Concrete hardener.--

Concrete hardener shall be commercial quality water borne penetrating type magnesium fluosilicate, zinc fluosilicate or combination thereof.

Concrete sealer.--

Concrete sealer shall be commercial quality VOC-compliant, silane type sealer with hydrophobic and oleophobic properties. Concrete sealer shall be ProSoCo, Inc., Standoff Tile and Masonry Protector (TMP); Tamms Industries, Hey'Di H.O.S.; Textured Coatings of America, Inc., Rainstopper 1750W-Clear; or equal.

ADMIXTURES.--

General.--Admixtures shall be used when specified or ordered by the Engineer and may be used at the Contractor's option to conserve cement or to facilitate any construction operation.

Calcium chloride shall not be used in any concrete.

Admixtures shall be combined with concrete materials by methods that produce uniform properties throughout the concrete.

If more than one admixture is used, said admixtures shall be compatible with each other so that the desirable effects of all admixtures will be realized.

Mineral admixtures may be used to replace up to 15 percent of Type II portland cement provided the weight of mineral admixture used is not less than the weight of cement replaced. Mineral admixtures shall not be used to replace Type IP (MS) Modified or Type III cements. Chemical admixtures may be used to reduce up to 5 percent of the portland cement except that the cement content shall not be less than 300 kg/m³. When both chemical and mineral admixtures are used with Type II cement, the weight of cement replaced by mineral admixture may be considered as cement in determining the resulting cement content.

Mineral admixtures will be required in the manufacture of concrete containing aggregates that are determined to be "deleterious" or "potentially deleterious" when tested in accordance with ASTM Designation: C 289. The use of mineral admixture in such concrete shall conform to the requirements in this section except that the use of set retarding admixtures will not be permitted.

When the use of a chemical admixture is specified or is ordered by the Engineer, the admixture shall be used at the rate specified or ordered. If no rate is specified or ordered, or if the Contractor uses a chemical admixture for his own convenience, the admixture shall be used at the dosage normally recommended by the admixture manufacturer.

When air-entrainment is specified or is ordered by the Engineer, the air-entraining admixture shall be used in amounts to produce concrete having the specified or ordered air content as determined by California Test 504. If the Contractor uses air-entrainment for his own convenience, the average air content shall not exceed 4 percent and no single test shall exceed 5 1/2 percent.

Chemical admixtures and air-entraining admixtures shall be dispensed in liquid form. Dispensers shall have sufficient capacity to measure at one time the total quantity required for each batch. If more than one liquid admixture is used in the concrete, a separate measuring unit shall be provided for each liquid admixture and dispensing shall be such that the admixtures are not mixed at high concentrations. When air-entraining admixtures are used with other liquid admixtures, the air-entraining admixtures shall be the first to be incorporated into the mix. Unless liquid admixtures are added to premeasured water for the batch, they shall be discharged to flow into the stream of water so that the admixtures are well dispersed throughout the batch.

BAR REINFORCING STEEL.--

Bending.--Reinforcing steel bars shall accurately conform to the dimensions shown on the plans.

Bars shall be bent or straightened in a manner that will not crack or break the material. Bars with kinks or improper bends shall not be used.

Hooks, bends and splices shall conform to the provisions of the Building Code Requirements for Reinforced Concrete of the American Concrete Institute.

MIXING AND TRANSPORTING CONCRETE.--

General.--When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be complete within 1 1/2 hours, or before 250 revolutions of the drum or blades, whichever comes first, after the introduction of cement to the aggregates.

Truck mixers or agitator shall be equipped with electrically or mechanically actuated revolution counters by which the number of revolutions of the drum or blades may readily be verified. The counters shall be of the continuous-registering type, which accurately register the number of revolutions and shall be mounted on the truck so that the Engineer may safely and conveniently inspect them from alongside the truck. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C or above, a time less than 1 1/2 hours may be required.

When non-agitating hauling equipment is used for transporting concrete to the delivery point, discharge shall be complete within one hour after the introduction of cement to the aggregates. Under conditions contributing to quick

stiffening of the concrete, or when the temperature of the concrete is 30°C, or above, the time between the introduction of cement to the aggregates and discharge shall not exceed 45 minutes.

Each load of concrete for the work shall be accompanied by a trip ticket, a copy of which shall be delivered to the Engineer at the jobsite. The trip ticket shall show volume of concrete, weight of cement and aggregates, quantity of each admixture, quantity of water including water added at the jobsite, time of day the concrete is batched, and revolution counter readings on transit mix trucks at the times the truck is charged and unloaded.

PART 3.- EXECUTION

PREPARATION.--

Existing concrete construction.--Where fresh concrete joins existing or previously placed concrete or masonry, the contact surfaces of the existing or previously placed material shall be roughened, cleaned, flushed with water and allowed to dry to a surface dry condition immediately prior to placing the fresh concrete. The roughened surface shall be no smoother than a wood trowelled surface. Cleaning of the contact surfaces shall remove laitance, curing compounds, debris, dirt and such other substances or materials which would prevent bonding of the fresh concrete.

Abrasive blast methods shall be used to clean horizontal construction joints to the extent that clean aggregate is exposed.

Exposed reinforcing steel located at the contact surfaces which is to be encased in the fresh concrete shall be cleaned to remove any substance or material that would prevent bonding of the fresh concrete.

Forms.--Forms shall be mortar tight, true to the dimensions, lines, and grades shown on the plans, securely fastened and supported, and of adequate rigidity to prevent distortion during placing of concrete.

Forms for exposed surfaces shall be constructed with triangular fillets not less than 19 mm x 19 mm attached so as to prevent mortar runs and to produce smooth straight chamfers at all sharp edges of the concrete.

Form fasteners shall be removable without chipping, spalling, heating or otherwise damaging the concrete surface. Form ties shall be removed to a depth of at least 25 mm below the surface of the concrete.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms shall be thoroughly coated with form oil prior to use.

Forms shall not be stripped until at least 40 hours after placing concrete, except soffit forms and supports shall not be released or removed until at least 10 days after placing concrete.

Anchorage and embedded items shall be placed and rigidly secured at their planned locations prior to placing concrete.

Reglets or embedded flashing shall be installed on concrete forms before the concrete is placed.

Redwood dividers shall have 4 mm x 89 mm galvanized nails partially driven into both vertical faces at 450 mm on centers.

Vapor barrier.--Vapor barrier shall be lapped 150 mm and securely taped at splices. Vapor barrier shall be protected with a 75 mm layer of clean uncompacted sand cover.

Unless otherwise shown on the plans, vapor barrier shall be placed under portions of the floor slab scheduled to receive finish flooring.

Placing reinforcing steel.--Reinforcing steel bars shall be accurately placed to the dimensions shown on the plans.

Bar reinforcement conforming to ASTM Designation: A 615/A 615M, Grade 60 [420], or A 706//A 706M shall be lapped at least 45 diameters.

Bars shall be firmly and securely held in position by means of wiring and approved bar supports. The spacing of supports and ties shall prevent displacement of the reinforcing or crushing of supports.

Tie wire shall be clear of concrete formwork and concrete surfaces.

All reinforcing steel shall be in place and inspected before concrete placement begins. Placing of bars on fresh layers of concrete will not be permitted.

Within areas where epoxy-coated reinforcement is required, tie wire and bar chairs or other metallic devices used to secure or support the reinforcement shall be plastic-coated or epoxy-coated to prevent corrosion of the devices or damage to the coated reinforcement.

PLACING CONCRETE.--

General.--Concrete shall be placed and consolidated by means of internal vibrators to form dense, homogeneous concrete free of voids and rock pockets.

Forms and subgrade shall be thoroughly moistened with water immediately before placing concrete.

Concrete shall be placed as nearly as possible to its final location and the use of vibrators for extensive shifting of the concrete will not be permitted.

Concrete shall be deposited and consolidated in a continuous operation within limits of construction joints, until the placing of the panel or section is completed.

When concrete is to be placed in large areas requiring more than two pours, concrete shall be placed in alternate long strips between construction joints and the final slab infilled.

Vibrators used to consolidate concrete containing epoxy-coated bar reinforcement shall have a resilient covering to prevent damage to such reinforcement.

FINISHING CONCRETE SURFACES.--

Finishing unformed surfaces.--Slabs shall be placed full thickness to finish elevation and leveled to screeds by use of long straightedges. The screeds shall be set to grade at approximately 1.8 meter centers. After leveling, screeds shall be removed and the surface shall be floated with wooden floats.

Type A control joint strips shall be inserted into the floated concrete so that the bottom of the top flange is flush with the finish elevation. Strips shall be standard manufactured lengths and shall be placed on an approximate straight line. The top flange of the strips shall be removed after the concrete has set and cured.

The floated surface shall be trowelled with steel trowels. Troweling shall form a dense, smooth and true finish. Walkways, pedestrian ramps, stairs and outdoor slabs for pedestrian traffic shall be given a non-slip broom finish unless a different finish is called for on the plans or in these special provisions.

The application of cement dust coat will not be permitted.

Steel trowel finish and broom finish will not be required for slabs to receive exposed aggregate finish nor for slabs to be covered with ceramic tile.

Concrete floor surfaces to receive ceramic tile shall be floated to grade and then, before final set of the concrete, the floated surfaces shall be roughened with stiff bristled brushes or rakes.

Finished surfaces of floor slabs shall not deviate more than 3 mm from the lower edge of a 3-meter long straight edge.

Finishing formed surfaces.--Formed concrete surfaces shall be finished by filling holes or depressions in the surface, repairing all rock pockets, and removing fins. All surfaces of formed concrete exposed to view shall have stains and discolorations removed, unsightly bulges removed, and all areas which do not exhibit the required smooth, even surface of uniform texture and appearance shall be sanded with power sanders or other approved abrasive means until smooth, even surfaces of uniform texture and appearance are obtained.

Cement mortar, patching and finishing materials used to finish exposed surfaces of concrete shall closely match the color of surrounding surfaces.

Nonskid abrasive aggregate finish.--Where shown on the plans, walkways shall receive a nonskid abrasive aggregate (grit) finish. The grit shall be applied uniformly at the rate of not less than 1.5 kg/m² and tamped into the floated concrete surface while the concrete is plastic. The grit shall be buried about 0.7-diameter of each particle into the concrete.

CURING CONCRETE.--

General.--Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperatures.

Initial curing of floor slabs shall start as soon as free water has disappeared from the concrete surface. The concrete shall be kept continuously wet by application of water for not less than 7 days after the concrete has been placed.

Cotton mats, rugs, carpets, or sand blankets may be used as a curing medium to retain the moisture during the curing period. Curing materials that will stain or discolor concrete shall not be used on surfaces exposed to view.

Prior to placing the curing medium, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. At the expiration of the curing period, the concrete surfaces shall be cleared of all curing mediums.

Concrete surfaces, other than floor slabs, shall be kept moist for a period of at least 5 days by leaving the forms in place or by covering the exposed surfaces using moist rugs, cotton mats or other curing materials approved by the Engineer.

Concrete curbs, sidewalks, collars, and gutter depressions may be cured with a curing compound.

PROTECTING CONCRETE.--

General.--Concrete shall not be placed on frozen or frost covered surfaces.

Concrete shall be protected from damage due to rain, freezing or inclement weather, and shall be maintained at a temperature of not less than 4°C for 72 hours. When required by the Engineer, the Contractor shall provide a written outline of his proposed methods of protecting concrete.

Vehicles, equipment, or concentrated loads weighing more than 140 kg individually and material stockpiles weighing more than 240 kg/m² will not be permitted on the concrete within 10 calendar days after placing.

SPECIAL TREATMENTS.--

Concrete hardener.--Chemical concrete hardener shall be applied to the floor surfaces shown on the plans, prior to the application of concrete sealer. Surfaces shall be clean and dry before the application of hardener.

The solution shall be applied in accordance with the manufacturer's instructions.

After the hardener has dried, the surface shall be mopped with water to remove encrusted salts.

12-3.02 PRECAST CONCRETE TILT-UP PANELS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work consist of constructing and erecting precast concrete tilt-up panels in accordance with the details shown on the plans and these special provisions.

The requirements of this special provision are in addition to the applicable requirements for concrete (structural work) and bar reinforcing steel in "Cast-in-Place Concrete," elsewhere in this Section 12-3.

Alternatives.--The Contractor may submit an alternative design for tilt-up panels using different details, concrete strengths or reinforcement for approval by the Engineer. Submittals for an alternative design must include detailed drawings of all elements of the design affected and complete design calculations signed by a Civil or Structural Engineer licensed in the State of California. Conformance with the details shown on the plans will preclude the necessity for the submittal of design calculations.

SUBMITTALS.--

Product data.--Manufacturer's data for bond breakers, inserts, lifting devices and bracing shall be submitted for approval.

Working drawings.--Complete working drawings showing panel dimensions, openings, location of items cast into panels for lifting and bracing, additional reinforcement required for lifting and bracing devices, construction loads and other pertinent information shall be submitted for approval.

Working drawings shall also include a location plan which shows the location, identification and sequence of erection for each tilt-up panel.

QUALITY ASSURANCE.--

Codes and standards.--Welds at panel connections shall conform to the requirements in AWS D1.1, "Structural Welding Code - Steel," for steel shapes and AWS D1.4, "Structural Welding Code - Reinforcing Steel," for bar reinforcing steel.

PART 2.- PRODUCTS

MATERIALS.--

Embedded items.--

Embedded items such as reglets, pressed metal door or window frames and other such items shall conform to the details shown on the plans.

Bond breaker.--

Bond breaker shall be a commercial quality solution containing no oils, waxes, paraffins, or other material which could affect the bond of subsequent finishes or natural appearance of the exposed concrete surfaces.

Form liners.--

Form liners shall be commercial quality liners as required to produce a panel finish as shown on the plans.

PART 3.- EXECUTION**CASTING PANELS.--**

General.--The installation of inserts and anchorages required to be set into the concrete panels prior to casting shall be coordinated with other work.

Curing base casting slabs.--Concrete surfaces upon which wall panels are to be cast, shall be cured as specified for other concrete except that paper or other curing sheets are not to be used.

The concrete shall be kept continuously wet by application of water for a minimum of 48 hours. Mats, rugs or sand blankets may be used to retain the moisture.

Upon completion of the water cure, a curing compound, certified to have qualities of a bond breaker, shall be applied in accordance with the manufacturer's instructions.

Forms.--Forms for precast units shall be mortar tight and well supported to prevent deformation or damage to the units. Form liners shall be accurately placed to provide a finished surface as shown on the plans.

Reinforcing steel and inserts.--Reinforcing steel shall be placed as for other concrete work. Anchorages, inserts and other cast-in-place items shall be located and firmly secured in position.

After placing reinforcing steel, inserts and other embedded items, the casting slab surface shall be checked for continuity of the bond breaker. Any damaged areas shall be repaired prior to placing the concrete.

Placing and curing concrete.--Concrete shall be placed, consolidated and cured as for other concrete work.

Curing may be completed with panels in the vertical position when sufficient strength is attained for lifting without damage.

ERECTION AND INSTALLATION.--

General.--Erection equipment shall be used with care to prevent damage to panels and floor slabs. Any damage shall be repaired prior to completion of the work.

Sequence of erection.--Sequence of erection and location of panels shall be as shown on the approved erection plan.

Erection.--Panels shall not be erected until at least 75 percent of the design strength shown on the plans has been attained and verified by the Contractor.

Panels shall be carefully lifted and tilted from the casting bed and erected plumb in accurate location and alignment. Wedges shall be used to accurately position panels. Panels shall be anchored in place as shown on the plans. Concrete mortar, grout or drypack shall be used to fill joints between the panels and foundation system.

Temporary bracing and supports shall be used to hold the panels in position. Braces and supports shall be maintained in position until closure pour strips, diaphragms, or other supporting structures are in place and capable of supporting the panels.

Welding.--Panels shall be welded to supports as shown on the plans.

PATCHING.--

General.--Holes in panels caused by lifting and bracing devices shall be patched as specified for other concrete work.

FIELD QUALITY CONTROL.--

Testing.--Concrete strength at the time of lifting shall be verified with tests conducted by the Contractor.

SECTION 12-4. MASONRY

12-4.01 CONCRETE MASONRY UNITS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of constructing reinforced hollow concrete masonry units in accordance with the details shown on the plans and these special provisions.

PERFORMANCE REQUIREMENTS.--

Unit Strength.--Provide masonry units that develop the following installed compressive strengths (f'm) at 28 days:
Based on net area f'm = 10.34 MPa

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for each type of masonry unit, accessory, and other manufactured products shall be submitted for approval.

Samples.--Two samples of masonry units of each color and architectural finish shall be submitted for approval.

QUALITY ASSURANCE.--

Masonry preconstruction testing service.--The Contractor shall employ and pay all costs for the services of a testing laboratory acceptable to the Engineer and experienced in performing preconstruction masonry tests. The testing laboratory shall comply with the requirements of ASTM Designation: E 329.

Preconstruction tests shall be performed on the following materials by the Unit Strength Method as defined by Section 2105, "Quality Assurance," of the Uniform Building Code:

Concrete masonry units shall be tested in accordance with ASTM Designation: C 140.

Grout shall be tested in accordance with ASTM Designation: C 1019.

In addition:

Mortar shall be tested in accordance with Uniform Building Code Standard: 21-16.

Test results shall be reported in writing to the Engineer and the Contractor on the same day the tests are made.

Single source responsibility.--Exposed masonry units of uniform color and texture shall be obtained from one manufacturer for each different product required for each continuous surface or visually related surfaces.

Mortar ingredients of uniform quality, including color for exposed masonry, shall be obtained from one manufacturer for each cementitious component and from one source and producer for each aggregate.

Certificates of Compliance.--Certificate of Compliance shall be furnished for masonry units, aggregate for grout and transit mixed grout in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, HANDLING AND STORAGE.--

Delivery.--Masonry materials shall be delivered to the project in an undamaged condition.

Storage and handling.--Masonry units shall be stored and handled in order to prevent deterioration or damage due to moisture, temperature changes, contamination, corrosion or other causes.

PART 2.- PRODUCTS

CONCRETE MASONRY UNITS.--

Concrete masonry units.--

Concrete masonry units shall be nominal size, color and architectural finish as shown on plans; hollow load bearing, medium weight, Grade N, Type II, conforming to ASTM Designation: C 90; standard or open ended masonry units.

Special shapes shall be provided where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

MORTAR AND GROUT MATERIALS.--

Cement.--

Cement for mortar shall be Type II, low alkali portland cement conforming to ASTM Designation: C 150; or masonry cement conforming to ASTM Designation: C 91.

Cement for grout shall be Type II portland cement conforming to ASTM Designation: C 150 with maximum 15 percent Class N, F, or C mineral admixture conforming to ASTM Designation: C 618 except that the loss on ignition shall not exceed 4 percent; or Type IP(MS) blended hydraulic cement conforming to ASTM Designation: C 595.

Aggregate.--

Aggregate for mortar shall conform to ASTM Designation: C 144, except not more than 10 percent shall pass the No. 100 sieve.

Aggregate for grout shall conform to ASTM Designation: C 404, except 100 percent of the coarse aggregate shall pass the 9.5 mm sieve. Soundness loss shall not exceed 10 percent as determined by California Test 214.

Coloring for mortar.--

Coloring for mortar shall be chemically inert, fade resistant mineral oxide or synthetic type.

Lime.--

Lime shall conform to ASTM Designation: C 207, Type S.

Premixed mortar or grout.--

A premixed packaged blend of cement, lime, and sand, with or without color, that requires only water to prepare for use as masonry mortar or grout may be furnished. Packages of premix shall bear the manufacturer's name, brand, contents, weight, and color identification.

Transit mixed grout.--

Transit mixed grout shall conform to ASTM Designation: C 94, except aggregate shall be as specified herein for aggregate for grout. The minimum compressive strength shall be 17236 kPa at 28 days when tested in accordance with ASTM Designation: C 39. Admixtures, if used, shall conform to ASTM Designation: C 494, Types A, E or F and shall not contain chlorides.

REINFORCEMENT, TIES AND ANCHORING DEVICES.--

Bar reinforcement.--

Bar reinforcement shall conform to ASTM Designation: A 615/A 615 M, Grade 60 [420], or ASTM Designation: A 706/A 706 M.

PROPORTIONING MORTAR AND GROUT.--

General.--Mortar shall be proportioned by loose volume and shall have one part cement, one quarter part of hydrated lime and 2 1/4 to 3 parts aggregate. Mortar shall be tinted with coloring to match the masonry units.

Grout, except transit mixed and packaged premix grout, shall be proportioned by loose volume and shall have one part cement, not more than 1/10 part hydrated lime, 2 1/4 to 3 parts sand aggregate, and not more than 2 parts gravel aggregate.

Aggregate shall be measured in a damp loose condition.

Grout shall be mixed with sufficient water to produce a mix consistency suitable for pumping without segregation. Slump shall not exceed 229 mm.

PART 3.- EXECUTION

CONSTRUCTION.--

General.--Masonry units shall be laid in running bond, except as otherwise shown on the plans.

Surfaces of metal, glass, wood, completed masonry, and other such materials exposed to view shall be protected from spillage, splatters and other deposits of cementitious materials from masonry construction. All such deposits shall be removed without damage to the materials or exposed surfaces.

Construction will comply with Section 2104 Construction of the Uniform Building Code. Tolerances specified in Section 2104 shall be in affect unless otherwise shown on the plans.

Where fresh masonry joins concrete or masonry, the contact surfaces of existing material shall be roughened, cleaned and lightly wetted. The roughened surface shall be no smoother than a wood troweled surface. Cleaning shall remove laitance, curing compounds, debris, dirt and any substance which decreases bond to the fresh masonry.

Masonry shall not be erected when the ambient air temperature is below 5° C.

Surfaces of masonry erected when the ambient air temperature exceeds 38° C. shall be kept moist with water for a period of not less than 24 hours. Water shall be uniformly applied with a fog spray at the intervals required to keep the surfaces moist but not to exceed 3 hours unless otherwise approved by the Engineer.

Laying masonry units.--Concrete masonry units shall be laid dry.

During laying of units all cells shall be kept dry in inclement weather by suitably covering incomplete walls. Wooden boards and planks shall not be used as covering materials. The covering shall extend down each side of masonry walls approximately 600 mm.

Where masonry unit cutting is necessary, all cuts shall be made with a masonry saw to neat and true lines. Blocks with excessive cracking or chipping of the finished surfaces exposed to view will not be acceptable.

Bar reinforcement.--Bar reinforcement shall be accurately positioned in the center of the cell and securely held in position with either wire ties or spacing devices near the ends of bars and at intervals not exceeding 192 bar diameters. Wire shall be 16-gage or heavier. Wooden, aluminum, or plastic spacing devices shall not be used. Tolerances for the placement of vertical reinforcement in walls and flexural elements shall be ± 12 mm. Tolerance for longitudinal reinforcement in walls shall be ± 50 mm.

The minimum spacing for splices in vertical reinforcement for masonry walls shall be 1220 mm plus lap.

Bar reinforcement shall not be placed in the plane of mortar joints.

Mortar.--Mortar joints shall be approximately 9.5 mm wide. Units shall be laid with all head and bed joints filled solidly with mortar for the full width of masonry unit shell. Head joints shall be shoved tight. Exposed joints shall be concave, tooled smooth, unless otherwise shown on the plans.

Mortar that has been mixed more than one hour shall not be retempered.

Mortar placed in joints shall preserve the unobstructed vertical continuity of the concrete filling. Any overhanging mortar projecting more than 12 mm, or other obstruction or debris shall be removed from the inside of such cells.

GROUTING.--

General.--All cells shall be filled solidly with grout. All grout in the cells shall be consolidated at the time of placement by vibrating and reconsolidated after excess moisture has been absorbed but before plasticity is lost. Slicing with a trowel is not acceptable.

Masonry units may be placed full height of the masonry work before grouting, or they may be placed in increments for individual grout pours.

Cleanouts shall be provided for all grout pours over 1524 mm in height. Such cleanouts shall be provided in the bottom course at every cell containing vertical reinforcement. After cell inspection, the cleanouts shall be sealed before filling with grout.

Masonry units shall be placed full height of the grout pour. Grout shall be placed in a continuous pour in grout lifts not exceeding 1828 mm. The interruption between placing successive lifts of grout shall be not more than one hour.

Between grout pours, a horizontal construction joint shall be formed by stopping the grout a minimum of 38 mm below the top of the last course, except if the joint is at a bond beam, it shall be 12 mm below the top of the bond beam unit, or at the top of the wall.

CLEANING AND PROTECTING MASONRY.--

General.--Splashes, stains or spots on the faces of the masonry exposed to view shall be removed. Completed masonry shall be protected from freezing for a period of at least 5 days.

SECTION 12-5. METALS

12-5.01 STRUCTURAL STEEL FOR BUILDINGS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of fabricating, assembling, furnishing and erecting structural steel in accordance with the details shown on the plans and these special provisions.

Structural steel consists of bars, shapes, plates, pipe, bolts, and headed studs.

Source quality control.--Materials and fabrication procedures are subject to inspection and tests in mill, shop and field, conducted by the Engineer or a qualified inspection agency. The Contractor or fabricator shall provide access to the Engineer or testing agency to places where the structural steel work is being fabricated or produced so that the required inspection and testing can be accomplished. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. The testing agency may inspect the structural steel at the plant before shipment; however, the Engineer reserves the right, at any time before final acceptance to reject the material that does not conform to the contract requirements.

REFERENCES.--

General.--Structural steel shall be fabricated, assembled and erected in accordance with American Institute of Steel Construction (AISC), "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings."

Welding shall be in accordance with American Welding Society (AWS) D1.1, "Structural Welding Code - Steel."

SUBMITTALS.--

Product data.--Product data for items to be incorporated into the work, including structural steel, high strength bolts, nuts and washers and alternative connectors, shall be submitted for approval.

Working drawings.--Working drawings and calculations shall be submitted for approval.

Working drawings shall show any changes proposed in the work, details of connections and joints exposed to the weather, details for connections not dimensioned on the plans, the sequence of shop and field assembly and erection, welding

sequences and procedures. If required, the location of butt welded splices on a layout drawing of the entire structure, and the location and details of any temporary supports that are to be used.

Calculations and working drawings for falsework to be used for the erection of structural steel shall be submitted for approval. The falsework shall be designed and constructed to provide the necessary rigidity and to support loads which will be applied. Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

CLOSEOUT SUBMITTALS.--

Final drawings.--At the completion of each building on the contract, one set of reduced prints on 27 kg (minimum) bond paper, 280 mm x 432 mm in size, of the corrected original tracings of all approved drawings for each building shall be furnished to the Engineer. An index prepared specifically for the drawings for each building containing sheet numbers and titles shall be included on the first reduced print in the set for each building. Reduced prints for each building shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

QUALITY ASSURANCE.--

Qualifications for welding.--A certified copy of qualification test record for welders shall be submitted to the Engineer at the jobsite. Descriptive data for equipment for field welding structural steel, including type and electric power requirements, shall be submitted for approval.

Certificates of Compliance.--Certificate of Compliance shall be furnished for structural steel products in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. Certificate of Compliance shall include mill test certificates for each heat number used in the work.

DELIVERY, HANDLING AND STORAGE.--

Structural materials shall be loaded, transported, unloaded and stored so that it is kept clean and undamaged. Material shall be stored above ground on platforms, skids, or other supports. Covers and protection shall be provided to protect the materials from corrosion.

Anchorage and anchor bolts, which are to be embedded in concrete or masonry, shall be delivered in ample time to not delay the work.

PART 2.- PRODUCTS

MATERIALS.--

Steel bars, plates and shapes.--

Steel bars, plates and shapes shall conform to ASTM Designation: A 36/A 36M or A 572/A 572M, Grade 50 [345].

Pipe.--

Pipe shall conform to ASTM Designation: A 53, standard weight, unless otherwise shown on the plans.

Steel tubing.--

Steel tubing shall conform to ASTM Designation: A 500, Grade B, or A 501.

Stud connectors.--

Stud connectors shall conform to ASTM Designation: A 108, Grades 1018 through 1020, cold drawn, either semi- or fully killed.

Anchor bolts, nuts and washers.--

Nonheaded anchor bolts shall conform to ASTM Designation: A 36/A 36M, with a minimum hook length of 6.2 diameters.

Headed anchor bolts shall conform to ASTM Designation: A 307.

Nuts shall conform to ASTM Designation: A 563M, Grade A.

Washers for anchor bolts shall be commercial quality.

Machine bolts, nuts and washers.--

Machine bolts and nuts shall conform to ASTM Designation: A 307.

Washers for machine bolts shall be commercial quality.

High strength (HS) bolts, nuts and washers.--

High strength (HS) bolts, nuts and washers shall conform to ASTM Designation: A 325M.

Direct tension indicators.--

Direct tension indicators shall conform to ASTM Designation: F 959.

Tension control fasteners.--

Tension control bolts shall have a splined end extending beyond the threaded portion of the bolt and which shears off when the specified bolt tension is attained.

Inorganic zinc primer.--

Inorganic zinc primer shall be a waterborne inorganic zinc primer conforming to the requirements of AASHTO Designation: M 300-92 I, Type II. Inorganic zinc primer shall be listed on the qualified products list which may be obtained from the Transportation Laboratory, (916) 227-7000.

Mortar.--

Mortar shall consist of one part cement, measured by volume, to 2 parts clean sand and only enough water to permit placing and packing.

FABRICATION.--

Shop fabrication and assembly.--Workmanship and finish shall be equal to the best general practice in modern shops.

Cuts shall not deviate more than 2 mm from the intended line. Roughness, notches or gouges shall be removed.

Bearing stiffeners at points of loading shall be square with the web and shall have at least 75 percent of the stiffener in contact with the flanges.

Finished members shall be true to line, shall have square corners and smooth bends and shall be free from twists, kinks, warps, dents and open joints.

Exposed edges and ends of metal shall be dressed smooth, with no sharp edges and with corners slightly rounded.

Stud connectors.--Steel surfaces shall be prepared as recommended by the manufacturer of the stud connectors. Stud connectors shall be welded to the flanges of beams or girders as shown on the plans. Automatic end welding of headed stud connectors shall be in accordance with the manufacturer's instructions.

Connections.--Abutting surfaces at connections shall be clean.

Cutting and welding at the jobsite will not be allowed except as shown on the approved drawings or specifically approved by the Engineer.

Finished holes for bolts shall be cylindrical and perpendicular to the plane of the connection. Subpunched and subdrilled holes shall be 6 mm smaller in diameter than the diameter specified for the finished hole.

Bolted Connections.--Bolts for connecting steel to steel shall be machine bolts conforming to ASTM Designation: A 307 or high-strength bolts conforming to ASTM Designation: A 325M as shown on the plans.

High-strength structural steel bolts, or equivalent fasteners, other bolts attached to structural steel, nuts, and washers shall be galvanized by mechanically deposited coating.

Holes for other work.--Holes for securing other work to structural steel and passage of other work through steel framing members shall be as shown on the approved drawings.

Threaded nuts or specialty items for securing other work to steel members shall be as shown on the approved drawings.

Holes shall be cut, drilled or punched perpendicular to metal surfaces. Holes shall not be flame cut or enlarged by burning. Holes are to be drilled in bearing plates.

SHOP PAINTING.--

General.--Structural steel members, except those to receive sprayed-fireproofing, shall be painted.

Surface preparation.--Surfaces of structural steel to receive inorganic zinc primer shall be blast cleaned in accordance with Steel Structures Painting Council, SSPC-SP 10, "Near-White Blast Cleaning."

Bolted connections.--Contact surfaces of high strength bolted connections and ungalvanized anchor bolt assemblies shall be blast cleaned and coated with waterborne inorganic zinc primer before assembly. The total thickness of primer on each surface shall be between 0.025 mm to 0.076 mm and may be applied in one application.

Painting.--Immediately after surface preparation, surfaces of structural steel shall receive an undercoat of waterborne inorganic zinc primer. Color shall essentially match Federal Standard 595B, No. 36373.

The manufacturer's published mixing and application instructions for inorganic zinc primer shall be followed.

PART 3.- EXECUTION

ERECTION AND ASSEMBLY.--

Field splices.--Field splices shall be made only at the locations shown on approved working drawings.

The parts shall be accurately assembled in their final position as shown on the plans and in true alignment with related and adjoining work before final fastening.

All parts shall be supported adequately and at locations to provide a vibration free, rigid, and secure installation.

Bolted connections.--All high strength bolted connections shall be made with high strength bolts installed with direct tension indicator washers or tension control fasteners.

When used, one mechanically galvanized direct tension washer shall be installed with each high strength bolt. Bolts shall be tightened until a direct tension indicator washer gap is 0.13 mm or less. A zero gap will not be cause for rejection.

During installation of tension control bolts, the torque required to turn the nut on the tension control bolt shall be counterbalanced by the torsion shear resistance of the splined end of the bolt.

The bolt head type and head location shall be consistent within a joint.

Nuts shall be on side of member least exposed to view.

Setting bases and bearing plates.--Concrete and masonry surfaces shall be cleaned and roughened to improve bond. Bottom of base and bearing plates shall be clean.

Base plates and bearing plates for structural members shall be set on wedges or other adjusting devices.

Anchor bolts shall be wrench tightened after supported members have been positioned and plumbed.

Mortar shall be solidly packed between bearing surfaces and base or bearing plates to ensure that no voids remain. Exposed surfaces shall be finished and allowed to cure.

FIELD PAINTING.--

Touch-up painting.--After erection, the Contractor shall clean field welds, bolted connections, and abraded areas of shop paint and apply the same materials as applied for shop painting.

Surfaces that are scheduled to receive finish coats shall be painted with an additional prime coat and finish coats in accordance with the requirements specified for shop primed steel under "Painting" in Section 12-9.

QUALITY CONTROL.--

Testing and inspection.--Ultrasonic examination shall be performed by the Contractor on at least 50 percent of all full penetration butt-welded splices in accordance with the requirements of AWS D1.1 and these special provisions.

Welding procedures and methods shall be subject to inspection for conformance with AWS D1.1.

Butt welds shall be tested in accordance with AWS D1.1, Chapter 6, Part C, Ultrasonic Testing of Groove Welds.

Examination, reporting and disposition of tests shall be in accordance with the provisions of 6.12, AWS D1.1.

In addition to ultrasonic examinations by the Contractor, welds may be subject to inspection or non-destructive testing by the Engineer.

When additional inspection or non-destructive testing is required by the Engineer, the Contractor shall provide sufficient access facilities in the shop and at the jobsite to permit the Engineer or his agent to perform such inspection and testing.

The Contractor shall correct all deficiencies in the structural steel work which inspections and laboratory test reports have indicated to be not in compliance with these special provisions. Additional tests shall be performed by the Contractor at his expense to reconfirm any non-compliance of original work, and to show compliance of the corrected work.

12-5.02 OPEN WEB STEEL JOISTS

PART 1.- GENERAL

Scope.--This work shall consist of designing, fabricating, furnishing and erecting pre-engineered, factory fabricated steel joists and accessories in accordance with the detail shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturers descriptive data, layout and anchorage details, quality control manual, welder qualifications, and installation instructions shall be submitted for approval.

Working drawings.--Complete working drawings and design calculations for the pre-engineered steel joists, permanent bracing, continuity angles and connection details shall be submitted for approval. Submittals shall be approved prior to the start of fabrication.

Working drawings shall show the size and shape of the truss members and temporary and permanent bracing members. Joint and connection details shall be shown.

Working drawings shall include a location plan which shows the location and identification of each steel joist.

Calculations for the design of the steel joists, bracing and connections shall include a list of applied loads and load combinations with the resulting member forces and member stresses. Steel joists and connections shall be designed for the chord forces shown on the plans.

Design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

If the design calculations contain or consist of computerized or tabulated calculations, the values pertaining to the design shall be identified, described or indexed in such a manner that a design review can be performed.

QUALITY ASSURANCE.--

Manufacturer Qualification.--Steel joists shall be manufactured by a firm experienced in manufacturing steel joists similar to those specified and with a record of successful in-service performance. Manufacturer shall be certified by SJI to manufacture joists complying with SJI standard specifications and load tables.

Codes and Standards.--Steel joists and permanent bracing shall be designed for the loads shown on the plans and other applied loads, including fire sprinkler systems. The design shall be in accordance with the requirements of the California Building Code (CBC) and the Steel Joist Institute "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders" (SJI-01).

Certificates of Compliance.--Certificates of Compliance shall be furnished for steel joists in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Identification.--Each joist shall be stamped or marked with a location identification mark or symbol and with the name and address of the manufacturer.

DELIVERY, STORAGE AND HANDLING.--

General.--Steel joists shall be delivered to the site in undamaged condition and stored off the ground in a well drained location, protected from damage, and easily accessible for inspection and handling. Covers shall be provided to protect the materials from corrosion.

Steel joists shall be handled in such a manner as to prevent damage due to bending and warping.

PART 2.- PRODUCTS

Open web steel joists.--

Open web steel joists shall conform to SJI-01, K-Series. Joists shall be designed to support the loads shown on the plans.

Bearing plates, fasteners and accessories.--

Bearing plates, fasteners and accessories shall be as shown on the approved working drawings.

Anchors.--

Anchors shall conform to the requirements in "Building Miscellaneous Metal" specified under Section 12-5, "Metals," of these special provisions.

FABRICATION.--

General.--Workmanship and finish shall be equal to the best general practice in modern steel fabrication shops. Construction shall conform to the SJI Code of Standard Practice.

Camber, if required by the design, shall be built into the joists.

CLEANING AND SHOP PAINTING.—

Painting.--Immediately after cleaning, surfaces of steel joists shall receive a one-coat shop applied steel prime coat of red oxide ferrous metal primer at a rate to provide a dry film thickness of not less than 0.04 mm.

PART 3.- EXECUTION

EXAMINATION.—

General.—The Contractor shall examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

ERECTION.--

General.--Installation of joists shall be in accordance with the approved working drawings. Steel joists and bracing members shall be accurately cut to provide tightly fitted joints and connections.

Joists shall be handled in a manner to avoid damage. Damaged joists shall be removed from the site, except when field repair is approved by the Engineer and such repairs are satisfactorily made in accordance with the manufacturer's recommendations.

Installation.--Steel joists shall be erected plumb and true and shall be secured rigidly in place in accordance with the approved working drawings. Joists shall not be field cut or otherwise altered without the written approval of the Engineer.

Temporary bracing shall be installed during erection to hold the joists plumb and true and in a safe position until sufficient permanent construction is in place to provide full stability.

Bearing plates shall have full bearing after the supporting members have been plumbed and properly positioned, prior to placing superimposed loads.

Connectors, fasteners and other hardware accessories shall be coordinated for placement in the proper locations and positions.

Joist bridging and anchoring shall be secured in place prior to the application of any construction loads. Any temporary loads shall be distributed so that the design carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging during construction or in the completed work.

All permanent bracing shall be secured in place before any sustained permanent loads are applied to the joist system.

Welding shall be by the tungsten inert gas arc welding method or the consumable electrode inert gas method. Welding processes that require the use of flux are not permitted.

All welds shall conform to the requirements of Section 8.15, "Quality of Welds," of the American Welding Society publication No. AWS D 1.1, "Structural Welding Code."

Exposed welds shall be ground smooth and flush.

CLEANING.—

General.—After erection, abraded, corroded, and field welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.

12-5.03 METAL DECK

PART 1.- GENERAL

SUMMARY.--

Scope.—This work shall consist of furnishing and installing metal deck in accordance with the details shown on the plans and these special provisions.

Metal deck includes ribbed sheet steel decking units, bent plates, accessories, fasteners and such other components, not mentioned, but required for a rigid, secure and complete installation.

REFERENCES.--

General.—The design, fabrication and erection of metal deck shall conform to the applicable requirements of the American Iron and Steel Institute (AISI) publication, "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members," and the applicable Steel Deck Institute Design Manual and these special provisions.

Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

SUBMITTALS.--

Product data.—Manufacturer's descriptive data for each type of deck and accessories shall be submitted for approval.

Working drawings.—Working drawings showing complete erection layouts, details, dimensions, deck section properties shall be submitted for approval. Drawings shall show types and gages, fastening methods, including the location, type and sequence of connections, sump pans, cut openings, surface finishes and temporary supports or bracing.

The metal deck supplier shall submit a fastening schedule and calculations stamped by an engineer who is registered as a Civil or Structural Engineer in the State of California showing that the metal roof panels, clips, and fasteners conform to the span and design loads shown on the plans and the wind uplift requirements of the Uniform Building Code as amended by Title 24, Part 2, California Code of Regulations.

QUALITY ASSURANCE.--

Qualification of field welding.—Welding processes and welding operators shall be qualified in accordance with "Welder Qualification," procedures in American Welding Society (AWS) D1.1, "Structural Welding Code - Steel."

Welding decking in place is subject to inspection and testing. Defective work shall be removed and replaced with acceptable work.

Certificates of Compliance.--Certificates of Compliance shall be furnished for the metal decking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, HANDLING AND STORAGE.--

General.--Metal deck units and accessories shall be transported, stored and erected in a manner that will prevent corrosion, distortion or other damage.

Deck units shall be stored off the ground with one end elevated to provide drainage.

PART 2.- PRODUCTS

MANUFACTURERS.--Acceptable manufacturers shall be; Verco Manufacturing Co.; BHP Co.; or equal.

MATERIALS.--

Deck units.--

Deck units, closures and plates shall be fabricated from galvanized sheet steel conforming to ASTM Designation: A 653/A 653M, Grade 33 [230].

Galvanizing shall conform to the requirements of ASTM Designation: A 924/A 924M, G60 [Z180].

Miscellaneous steel shapes.--

Miscellaneous steel shapes shall conform to ASTM Designation: A 36/A 36M.

Anchor clips, vent clips, flashing, saddle plates, flexible closure strips and other accessories.--

Anchor clips, vent clips, flashing, saddle plates, flexible closure strips and other accessories shall be as recommended by the decking manufacturer.

FABRICATION.--

General.--Deck units shall be formed to span 2 or more supports, with flush, telescoped or nested 50 mm laps at ends and interlocking or nested side laps unless otherwise shown on the plans.

Deck units shall conform to the configurations, metal thickness, depth and width and section properties shown on the plans.

End bearing shall be not less than 38 mm.

Metal closure strips.--Metal closure strips for opening between deck units and other construction shall be fabricated from the same gage and material as the adjacent deck units. Strips shall be formed to provide tight-fitting closures at end of cells or flutes and sides of decking.

Cleaning.--When spray-on fireproofing is specified, the decking manufacturer shall supply decking free of amounts of oil or lubricants which would significantly impair the adhesion of the spray-on fireproofing.

PART 3.- EXECUTION

INSTALLATION.--

General.--Deck units and accessories shall be installed in accordance with the manufacturer's recommendations and approved drawings and these special provisions.

Units shall be placed on supporting steel framework, adjusted in place and properly aligned before being permanently fastened. Ends of units shall have positive bearing over structural supports.

Cutting and fitting shall present a neat and true appearance with exposed burrs removed. Openings through the decking shall be cut square and shall be reinforced as recommended by the decking manufacturer.

The metal deck shall not be used as a working platform before deck units are fastened in place. Supplies, equipment or other loads shall not be stored on the deck. Mechanical equipment or other loads shall not be hung from metal roof decking.

Welding.--Welding shall conform to AWS requirements (D1.1 and D1.3) and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

Welding washers shall be used where recommended by the manufacturer.

Fastening roof deck units.--Roof deck units shall be fastened to supporting steel members as shown on the structural plans.

Fastening side laps.--Side laps of adjacent deck units shall be fastened as shown on the plans.

Field painting.--Immediately following erection, field welds, bolted connections and abraded areas shall be cleaned with a wire brush.

Galvanized surfaces shall be touched-up with galvanizing repair paint recommended by the manufacturer.

12-5.04 COLD FORMED METAL FRAMING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing cold formed metal framing, including load-bearing and non-bearing steel studs, and "C"-shaped steel joists and rafters, in accordance with the details shown on the plans and these special provisions.

SYSTEM DESCRIPTION.--

Loadings.--Components shall be sized as shown on the plans.

Wall system shall be designed to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclical day/night temperature range.

Wall system shall accommodate construction tolerance, deflection of building structural members, and clearances of intended openings.

REFERENCES.--

Component design.--Structural properties of studs and joists shall be computed in accordance with American Iron and Steel Institute (AISI), "Specification for Designing of Cold-Formed Steel Structural Members."

Welding.--Welding shall be in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

Welders shall be qualified in accordance with "Welder Qualification," procedures of AWS D1.1, "Structural Welding Code-Steel."

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for each item of cold-formed metal framing and accessories shall be submitted for approval.

Installation instructions shall include instructions for securing studs to tracks and other framing connections.

Working drawings.--Working drawings and calculations for cold formed metal framing components not fully dimensioned in manufacturer's descriptive data shall be submitted for approval.

Working drawings shall include framing members showing size and gage designations, number, type, location and spacing. Working drawings shall include supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

The cold formed metal framing supplier shall submit drawings and calculations stamped by an Engineer who is registered as a Civil or Structural Engineer in the State of California showing that the metal framing and fasteners comply

with seismic and wind uplift requirements of the Uniform Building Code as amended by Title 24, Part 2, California Code of Regulations.

QUALITY ASSURANCE.--

Fire-rated assemblies.--Where cold formed metal framing units are components of assemblies indicated to be fire-rated, provide units which have been approved for the rating indicated on the plans.

DELIVERY, STORAGE AND HANDLING.--

General.--Cold formed metal framing components shall be protected from rusting and damage. Components shall be delivered to the job site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Components shall be stored off ground in a dry ventilated space.

PART 2.- PRODUCTS

COLD FORMED METAL FRAMING.--

Steel studs, joists and rafters.--

Load-bearing studs shall be formed to channel shape, punched web, and knurled faces, conforming to ASTM Designation: A 653/A 653M, Grade 50 [340]. Studs shall be 1.52 mm (16-gage) minimum thickness and size as shown on the drawings.

Joists, rafters, and other framing components, 1.21 mm (18-gage) or lighter, shall be fabricated of commercial quality galvanized steel sheets; conforming to ASTM Designation: A 653/A 653M, Grade 33 [230].

Steel Track.--

Track shall be formed steel, channel shape, and same width as studs; solid web; not less than 1.21 mm (18-gage) thickness.

ACCESSORIES.--

Fasteners.--

Fasteners shall be hot-dipped galvanized, self-drilling, self-tapping screws, or bolts, nuts and washers.

Anchorages.--

Anchorages shall be ICBO approved for the purpose intended, integral stud type, powder driven or drilled expansion bolts.

FINISHES.--

Studs, track and headers.--

Studs, tracks and headers shall be hot-dipped galvanized to conform to ASTM Designation: A 653M, G60.

Miscellaneous metal parts.--

Miscellaneous parts, including, bracing, furring, plates, gussets, and bridging, shall be hot dipped galvanized to not less than 381 kilograms per square meter.

FABRICATION.--

General.--Cold formed metal framing components shall be fabricated in place or prefabricated into panels to the maximum extent possible prior to erection. Panels shall be fabricated plumb, square, true to line and braced against racking with joints welded. Lifting of prefabricated panels shall be performed in a manner to prevent damage or distortion.

Panels shall be fabricated in jig or templates to hold members in proper alignment and position to assure accurate placement.

Fastenings.--Components shall be fastened by shop welding, bolting or screw fasteners as shown on the approved drawings.

PART 3.- EXECUTION

INSTALLATION.--

Studs.--Studs shall be erected plumb, except as needed for diagonal bracing or similar requirements. Channel tracks shall be aligned accurately to the wall layout at both floor and ceiling. Tracks shall be secured to floor and ceiling with fasteners spaced at not more than 406 mm intervals. Fasteners shall be provided at corners and ends of track.

Studs shall extend from floor to underside of ceiling except at wall openings. Each stud shall be secured to tracks at both top and bottom by bolting or screw fastening at both inside and outside flanges. Field welding shall not be permitted. A 12 mm clearance shall be provided at the top shoes. Door openings shall have double studs continuous across head and from floor to ceiling on each jamb.

Studs at openings shall be fastened solidly and securely to floor clips. Floor clips shall be fastened to the floor with 2 anchors unless otherwise shown on the plans.

Supplemental framing, blocking and bracing shall be installed in steel stud system wherever walls or partitions are to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition.

One continuous, horizontal 19 mm channel reinforcement shall be placed approximately 152 mm above all wall openings. The reinforcement shall pass through the web openings in the studs and shall extend through the first stud located beyond the double studs at either side of the opening and shall be saddle tied to each stud it passes through.

Joists and rafters.--Joists and rafters shall be installed directly over bearing studs or a load distribution member shall be installed at the top track.

Web stiffeners shall be provided at reaction points where shown on the plans.

Ends of joists shall be reinforced with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by the manufacturer.

Joists shall be secured to interior support systems to prevent lateral movement of bottom flanges.

12-5.05 BUILDING MISCELLANEOUS METAL

PART 1.-GENERAL

SUMMARY.—

Scope.--This work shall consist of fabricating and installing miscellaneous metal in accordance with the details shown on the plans and these special provisions. This Section includes the following:

- Steel framing and supports for mechanical and electrical equipment.
- Steel framing and supports for applications where framing and supports are not specified in other Sections.
- Loose bearing and leveling plates.
- Steel weld plates and angles for casting into concrete and masonry not specified in other Sections.
- Structural-steel door frames.
- Miscellaneous steel trim including steel angle corner guards.
- Metal ladders.
- Metal bollards.
- Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

SUBMITTALS.—

Product data.--Manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications shall be submitted for approval.

Working Drawings—The Contractor shall submit for approval, fabrication and installation details for metal fabrications. Plans, elevations, sections, and details of metal fabrications and connections shall be included. Show anchorage and accessory items. Templates for anchors and bolts specified for installation under other sections shall be provided.

Calculations— structural analysis for installed products indicated to comply with design loads, shall be included, signed and sealed by a qualified professional engineer responsible for their preparation.

QUALITY ASSURANCE.—

Welding—Qualify procedures and personnel according to the following:

AWS D1.1, "Structural Welding Code--Steel."

AWS D1.3, "Structural Welding Code--Sheet Steel."

Inspection and tests—Materials and fabrication procedures shall be subject to inspection and tests by the Engineer, in mill, shop and field. Such tests will not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

PROJECT CONDITIONS.—

Field Measurements—The Contractor shall verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Working Drawings.

Established Dimensions—Where field measurements cannot be made without delaying the Work, the Contractor shall establish dimensions and proceed with fabricating metal fabrications without field measurements. Wall and other contiguous construction shall be coordinated to ensure that actual dimensions correspond to established dimensions. Allowance for trimming and fitting at site shall be provided.

COORDINATION

The Contractor shall coordinate installation of anchorages for metal fabrications. Setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry shall be furnished. Items shall be delivered to Project site in time for installation.

Installation of steel weld plates and angles shall be coordinated for casting into concrete that are specified in this Section but required for work of another Section. Items shall be delivered to Project site in time for installation.

PART 2.- PRODUCTS

METALS.—

General—The Contractor shall provide materials with smooth, flat surfaces, unless otherwise indicated. Metal fabrications exposed to view in the completed Work shall be provided without seam marks, roller marks, rolled trade names, or blemishes.

FERROUS METALS.—

Steel Plates, Shapes, and Bars—ASTM A 36/A 36M.

Rolled-Steel Floor Plate—ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

Steel Tubing—ASTM A 500, cold-formed steel tubing.

Steel Pipe—ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

FASTENERS.—

General--Unless otherwise indicated, the Contractor shall provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Stainless-steel fasteners shall be provided for fastening aluminum. Fasteners shall be selected for type, grade, and class required.

Anchor Bolts--ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

Machine Screws--ASME B18.6.7M.

Lag Bolts--ASME B18.2.3.8M.

Wood Screws--Flat head, ASME B18.6.1.

Plain Washers--Round, ASME B18.22M.

Lock Washers--Helical, spring type, ASME B18.21.2M.

Cast-in-Place Anchors in Concrete--Anchors shall be provided capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

Threaded or wedge type shall be galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Bolts, washers, and shims shall be provided as needed, and hot-dip galvanized per ASTM A 153/A 153M.

Expansion Anchors--Anchor bolt and sleeve assembly shall be provided with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

Material for Anchors in Interior Locations--Carbon-steel components zinc-plated shall comply with ASTM B 633, Class Fe/Zn 5.

MISCELLANEOUS MATERIALS.—

Welding Rods and Bare Electrodes--Welding rods and electrodes shall be selected according to AWS specifications for metal alloy welded.

Shop Primers--Primers shall be provided that comply with the requirements specified under "Painting," in Section 12-9, "Finishes," of these special provisions. Primer shall contain pigments that make it easily distinguishable from zinc-rich primer.

Zinc-Rich Primer--Zinc-rich primers shall comply with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

Galvanizing Repair Paint--Galvanized repair paint shall be high-zinc-dust-content paint for re-galvanizing welds in steel, and comply with SSPC-Paint 20.

Bituminous Paint--Bituminous paint shall be cold-applied asphalt emulsion complying with ASTM D 1187.

Nonshrink, Nonmetallic Grout--Grout shall be factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Grout shall be specifically recommended by manufacturer for interior and exterior applications.

FABRICATION, GENERAL.—

Shop Assembly-- Items shall be preassembled in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Metals shall be cut, drilled, and punched cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1 mm, unless otherwise indicated. Sharp or rough areas on exposed surfaces shall be removed.

Bent-metal corners shall be formed to smallest radius possible without causing grain separation or otherwise impairing work.

Exposed work shall be formed true to line and level with accurate angles and surfaces and straight edges.

Corners and seams shall be welded continuously to comply with the following:

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

Remove welding flux immediately.

At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Exposed connections shall be formed with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, Phillips flat-head (countersunk) screws or bolts, shall be used unless otherwise indicated. Joints shall be located where least conspicuous.

Seams and other connections shall be fabricated that will be exposed to weather in a manner to exclude water. Weep holes shall be provided where water may accumulate.

Metal fabrications Shall be cut, reinforced, drilled, and tapped as indicated to receive finish hardware, screws, and similar items.

Anchorage shall be provided of type indicated; coordinate with supporting structure. Anchoring devices shall be spaced to secure metal fabrications rigidly in place and to support indicated loads.

Units are indicated to be cast into concrete or built into masonry shall be equipped with integrally welded steel strap anchors, 3.2°mm by 38°mm, with a minimum 150°mm embedment and 50°mm hook, not less than 200°mm from ends and corners of units and 600°mm o.c., unless otherwise indicated.

MISCELLANEOUS FRAMING AND SUPPORTS

General--Steel framing and supports shall be provided not specified in other Sections as needed to complete the Work.

Units shall be fabricated from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Sizes, shapes, and profiles shall be fabricated indicated and as necessary to receive adjacent construction retained by framing and supports. Units shall be cut, drilled, and tapped to receive hardware, hangers, and similar items.

Miscellaneous framing and supports shall be primed with zinc-rich primer where indicated.

STEEL WELD PLATES AND ANGLES.--

Steel weld plates and angles not specified in other Sections shall be provided for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

STRUCTURAL-STEEL DOOR FRAMES.--

Structural-steel door frames shall be fabricated from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 16-by-38-mm steel channel stops, unless otherwise indicated. Built-up members shall be plug-welded and continuously weld exposed joints. Removable stops shall be secured to frame with countersunk machine screws, uniformly spaced at not more than 250 mm o.c. Frames shall be reinforced and drilled and tap as necessary to accept finish hardware. Integrally welded steel strap anchors shall be provided for securing door frames into adjoining concrete or masonry.

Exterior miscellaneous steel trim and interior miscellaneous steel trim shall be primed where indicated with zinc-rich primer.

METAL LADDERS.--

General—Design and construction of steel ladders shall comply with ANSI A14.3, unless otherwise indicated.

Siderails shall be spaced 406 mm apart, unless otherwise indicated.

Each ladder shall be supported at top and bottom and not more than 1500 mm o.c. with welded or bolted brackets, made from same metal as ladder.

Exterior ladders shall be galvanized including brackets and fasteners.

METAL BOLLARDS

Metal bollards shall be fabricated from Schedule 80 steel pipe.

FINISHES.—

General.—Finishes shall comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finishes shall be applied to metal fabrications after assembly.

STEEL AND IRON FINISHES

Galvanizing--Hot-dip galvanize shall be applied to items as indicated to comply with applicable standard listed below:
ASTM A 123/A 123M, for galvanizing steel and iron products.
ASTM A 153/A 153M, for galvanizing steel and iron hardware.

Preparation for Shop Priming--Uncoated ferrous-metal surfaces shall be prepared to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

Exteriors (SSPC Zone 1B) **and Items Indicated to Receive Zinc-Rich Primer**--SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

Interiors (SSPC Zone 1A)--SSPC-SP 3, "Power Tool Cleaning."

Shop Priming--Shop primer shall be applied to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Shop painting shall comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel."

Corners, crevices, bolts, welds, and sharp edges shall be stripe painted.

PART 3.- EXECUTION

PREPARATION.—

General.—The Contractor shall preassemble items in shop to the greatest extent possible to minimize field splicing and assembly. Units shall be disassembled only as necessary for shipping and handling limitations. Units shall be clearly marked for re-assembly and installation.

INSTALLATION.—

Cutting, Fitting, and Placement--Cutting, drilling, and fitting shall be performed for required installation of metal fabrications. Metal fabrications shall be set accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

Exposed connections shall be fit accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Surfaces of exterior units shall not welded, cut, or abraded that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

Field Welding—The Contractor shall comply with the following requirements:

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

Remove welding flux immediately.

At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Fastening to In-Place Construction--Anchorage devices and fasteners shall be provided where metal fabrications are required to be fastened to in-place construction. Threaded fasteners shall be provided for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

Temporary bracing or anchors shall be provided in formwork for items that are to be built into concrete, masonry, or similar construction.

INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS.—

General--Framing and supports shall be installed to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on working drawings.

INSTALLING BEARING AND LEVELING PLATES

Concrete and masonry bearing surfaces shall be cleaned of bond-reducing materials, and roughen to improve bond to surfaces. The bottom surface of plates shall be cleaned.

Bearing and leveling plates shall be set on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Wedges or shims shall not be removed but, if protruding, shall be cut off flush with edge of bearing plate before packing with grout.

Nonshrink grout shall be used, either metallic or nonmetallic, in concealed locations where not exposed to moisture; and nonshrink, nonmetallic grout used in exposed locations, unless otherwise indicated.

Grout shall be packed solidly between bearing surfaces and plates to ensure that no voids remain.

INSTALLING PIPE BOLLARDS

Bollards shall be placed in vibrated concrete or concrete tamped for consolidation. Bollards shall be supported and braced in position until concrete has cured.

Bollards shall be filled solidly with concrete, mounding top surface to shed water.

ADJUSTING AND CLEANING

Touchup Painting--Immediately after erection, field welds, bolted connections, and abraded areas shall be cleaned. Uncoated and abraded areas shall be painted with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

Apply by brush or spray to provide a minimum 0.05-mm dry film thickness.

Galvanized Surfaces—The Contractor shall clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

12-5.06 EXPANSION JOINT COVER ASSEMBLIES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing vertical and horizontal expansion joint assemblies, fillers and sealers for expansion and seismic joints in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for vertical and horizontal expansion joint assemblies, seals and sealants shall be submitted for approval.

PART 2.- PRODUCTS

MANUFACTURERS.--

Acceptable manufacturers.--Subject to these special conditions, acceptable manufacturers shall be D. S. Brown Co.; General Tire Engineered Construction Products; Watson Bowman and Acme Corp. (Wabco); or equal.

MATERIALS.--

General.--Expansion joint closures and seals shall be aluminum extrusions and neoprene or silicone rubber seals of the type and size to suit the construction as shown on the plans.

Aluminum retainers and cover plates.--

Aluminum retainers and cover plates shall conform to ASTM Designation: B 221M, 6063-T5, anodized, of the configuration and size indicated or recommended by the expansion control system manufacture.

Visual seals.--

Visual seal shall be dense neoprene or dense silicone synthetic rubber conforming to ASTM Designation: C 864, 70 durometer hardness, plus or minus 5.

Functional seal.--

Functional seal shall be closed cell neoprene synthetic rubber conforming to ASTM Designation: C 509, medium density.

Fasteners.--

Fasteners shall be the expansion joint assembly manufacturer's standard corrosion resistant fasteners.

Sealant.--

Sealant shall be as recommended by the expansion joint assembly manufacturer.

PART 3.- EXECUTION

PREPARATION.--

Surface preparation.--Supporting joint surfaces shall be prepared as recommended by the manufacturer. Edges of the substrate shall be level and sound.

INSTALLATION.--

General.--Expansion joint cover assemblies shall be installed and set to the proper width for the ambient temperature at the time of setting.

Nominal width shall be based on an ambient width shown on the plans.

Expansion joint cover assemblies shall be set according to the manufacturer's recommendations.

CLEANING.--

General.--Unused materials, containers, and equipment shall be removed from the work area.

Surfaces that are stained, marred or otherwise damaged shall be cleaned and repaired.

SECTION 12-6. WOOD AND PLASTICS

12-6.01 ROUGH CARPENTRY

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing materials and performing rough carpentry work including wood framing, furring, and sheathing in accordance with the details shown on the plans and these special provisions.

Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed.

SUBMITTALS.--

Product Data.--Manufacturer's material data and installation instructions shall be submitted for gypsum sheathing, framing hardware and underlayments.

Wood treatment data.--Chemical treatment manufacturer's instructions shall be submitted for the handling, sorting, installation, and finishing of treated materials.

For each type of preservative treatment used, certification by treating plant shall include type of preservative solution and pressure process used, net amount of preservative retained and conformance with the applicable standards of the American Wood Preservers Association.

For each type of fire-retardant treatment, include certification by treating plant that the treated material complies with the applicable standards and other requirements.

DELIVERY, HANDLING AND STORAGE.--

Delivery and storage.--Materials shall be kept under cover and dry. All materials shall be protected from exposure to weather and contact with damp or wet surfaces with blocking and stickers. All lumber, plywood and other panels shall be stacked in such a manner to provide air circulation within and around the stacks.

PART 2.- PRODUCTS

LUMBER.--

General.--Lumber shall be manufactured to comply with PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection.

Softwood lumber shall be quality grade stamped or shall be accompanied by a certificate of inspection. Inspection certificates or grade stamps shall indicate compliance with the grading requirements of WWPA, WCLIB, RIS, or other approved lumber inspection agencies.

All lumber used shall be nominal sized and dressed S4S unless otherwise specified in these special provisions.

Framing lumber shall be solid stock lumber, Douglas Fir-Larch, and the grades indicated under WCLIB or WWPA rules. Moisture content shall not exceed 19 percent and shall be grade stamped "S-Dry."

Miscellaneous lumber.--

Miscellaneous lumber for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members shall be not less than No. 2 or better.

Lumber in contact with concrete or masonry construction shall be pressure treated Douglas Fir-Larch.

PLYWOODPANELS.--

General.—Plywood panels shall comply with Voluntary Product Standard PS1, "U. S. Product Standard for Construction and Industrial Plywood."

Plywood panels shall be Group 1 unless otherwise noted.

Each plywood panel shall be factory marked with APA or other trademark evidencing compliance with grade requirements.

Structural plywood wall sheathing.--

Structural plywood wall sheathing for walls shall be APA RATED SHEATHING, Exposure 1. Thickness and grade shall be as shown on the plans.

MISCELLANEOUS MATERIALS.--

Expansion anchors and powder driven anchors shall be as specified under "Miscellaneous Metal," in Section 12-5, "Metals," of these special provisions.

WOOD TREATMENT BY PRESSURE PROCESS.--

Preservative treatment.--

Preservative treatment shall be copper naphthenate, pentachlorophenol or water-borne arsenicals (ACA, CCA or ACZA).

The following items shall be treated:

Wood cants, nailers, curbs, equipment support bases, blocking, stripping and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

Wood sills, sleepers, blocking, furring and other similar members in contact with concrete or masonry.

All holes, daps and cut ends of treated lumber shall be thoroughly swabbed with 2 applications of copper naphthenate.

PART 3.- EXECUTION

INSTALLATION.--

Plywood panels.--Plywood structural panels shall be attached to the framing as shown on the plans.

12-6.02 FINISH CARPENTRY

PART 1.- GENERAL

SUMMARY.--

Scope.--This work consists of furnishing and installing materials and performing finish carpentry, including plywood and softwood paneling, as shown on the plans and these special provisions.

Finish carpentry includes carpentry work not specified as part of other sections and which is generally exposed to view.

SUBMITTALS.--

Product data.--Manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

Samples.--One sample shall be submitted to the Engineer at the jobsite for each species and cut or pattern of finish carpentry as shown below:

Interior standing and running trim - 610 mm long by full board or molding width, finished on one side and one edge.

Plywood paneling - 610 mm long x full panel width, finished on one side.

QUALITY ASSURANCE.--

Factory marks.--Each piece of lumber and plywood shall be marked with type, grade, mill and grading agency identification. Marks shall be omitted from surfaces to receive transparent finish. A mill certificate stating that material has

been inspected and graded in accordance with requirements shall be furnished if marks cannot be placed on concealed surfaces.

PRODUCT DELIVERY, STORAGE AND HANDLING.--

Delivery.--Carpentry materials shall be delivered after painting, wet work and similar operations have been completed.

Protection.--Finish carpentry materials shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2.- PRODUCTS

WOOD PRODUCT QUALITY STANDARDS.--

Softwood lumber.--Softwood lumber shall conform to the requirements of PS 20, "American Softwood Lumber Standard," with applicable grading rules of inspection.

Plywood.--Plywood shall conform to the requirements of Voluntary Products Standard PS-1, "U. S. Product Standard for Construction and Industrial Plywood."

Woodworking.--Woodworking shall conform to the requirements of Woodwork Institute of California (WIC), "Manual of Millwork."

MATERIALS.--

General.--Lumber sizes indicated shall be nominal sizes except as indicated by detailed dimensions. Lumber which is to be dressed or worked and dressed shall be manufactured to the actual sizes as required by PS 20.

Lumber that is to receive a transparent finish (stained or clear) shall be made of solid lumber stock.

Lumber that is to be painted may be solid or glued-up lumber at the contractor's option.

Plywood paneling and wainscotting.--

Plywood paneling and wainscotting shall be APA Interior Grade A-C, Group 1, Exposure 1 plywood. Thickness shall be as shown on the plans.

Interior standing and running trim.--

Standing and running trim to be painted shall be paint-grade pine, solid stock or finger jointed.

Standing and running trim to have transparent finish shall be solid hardwood, species to be shown on the plans.

Miscellaneous Materials.--

Nails, screws and other anchoring devices of the type, size, material and finish required shall be provided for secure attachment, concealed where possible.

Fasteners and anchorages for exterior use shall be hot dip galvanized.

PART 3.- EXECUTION

INSTALLATION.--

General.--All work shall be installed plumb, level and true with no distortions.

Standing and running trim.--Standing and running trim shall be installed with minimum number of joints possible, using full length pieces to the greatest extent possible.

Anchor finish carpentry.--Finish carpentry shall be anchored to framing or blocking built in or attached directly to the substrate.

Interior carpentry shall be attached to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing where required for complete installation. Fine finish nails shall be used for exposed nailing, countersunk and filled flush with finished surface and matching final finish where transparent finish is indicated.

ADJUSTMENT, CLEANING, FINISHING AND PROTECTION.--

General.--Damaged and defective finish carpentry work shall be repaired or replaced.

All exposed or semi-exposed surfaces shall be cleaned.

Finish carpentry shall be finished in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-6.03 CABINETS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a swinging gate, wood cabinets and plastic laminate tops, splashes and returns as shown on the plans and in these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's product data for plastic laminates and cabinet hardware shall be submitted for approval.

Samples.--Three samples shall be submitted for each of the items shown below:

Plastic laminate, 203 mm x 254 mm for each type, color, pattern and surface finish.

Working drawings.--Working drawings for cabinets showing location of cabinets, dimensioned plans and elevations, attachment devices and other components shall be submitted for approval. Working drawings shall bear the "WIC Certified Compliance Label" on the first sheet of the drawings.

QUALITY ASSURANCE.--

Codes and standards.--Cabinets and swinging gate shall be manufactured and installed in accordance with the Manual of Millwork of the Woodwork Institute of California (WIC) requirements for the grade or grades specified or shown on the plans.

Certificates of Compliance.--Prior to delivery to the jobsite, the cabinet manufacturer shall issue a WIC Certified Compliance Certificate indicating that the products he will furnish for this job and certifying that they will fully meet all the requirements of the grade or grades specified.

WIC Certified Compliance Label shall be stamped on all cabinet work and swinging gate.

Each plastic laminate top shall bear the WIC Certified Compliance Label.

Prior to completion of the contract, a WIC Certified Compliance Certificate for Installation shall be delivered to the Engineer.

DELIVERY, STORAGE AND HANDLING.--

Protection.--Cabinets shall be protected during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

PART 2.- PRODUCTS

ACCEPTABLE MANUFACTURERS.--

Manufacturers.--Subject to compliance with these specifications, high pressure decorative laminates shall be Consoweld Corp.; Formica Corp.; Nevamar Corp.; or equal.

MANUFACTURED UNITS.--

General.--Cabinets shall be fabricated to the dimensions, profiles, and details shown on the plans with openings and mortises precut, where possible to receive hardware and other items and work.

Fabrication, assembly, finishing, hardware application, and other work shall be completed to the maximum extent possible prior to shipment to the jobsite.

Laminate clad cabinets.--

Laminate clad cabinets shall be custom grade, flush overlay construction.

Laminate cladding shall be high pressure decorative laminate complying with NEMA LD 3. Color, pattern and finish shall be as shown on the plans. Laminate surface and grade shall be as follows:

Horizontal and vertical surfaces other than tops shall conform to GP-50 (1.27 mm nominal thickness).

Post formed surfaces shall conform to PF-42 (1.07 mm nominal thickness).

Laminated counter tops and splashes.--

Laminated counter tops and splashes shall be WIC custom grade.

Surface material shall be high pressure laminated plastic conforming to NEMA LD-3, 1.27 mm thickness.

Unless otherwise shown on the plans, splashes shall be 102 mm high from the surface of the deck. Back splashes shall be continuous formed and coved. Side splashes shall be top set.

Laminated counter tops self edged, counter tops to receive sinks or plumbing fixtures shall have a bullnose.

The underside of tops and backsides of splashes shall be covered with an approved backing sheet.

Stainless steel counter top.--Stainless steel counter tops shall be constructed with 18 gage sheet with No. 4 finish.

CABINET HARDWARE AND ACCESSORY MATERIALS.--

General.--Cabinet hardware and accessory materials shall be provided for cabinets. Hardware shall be provided with standard 26D metal plated finish.

Drawer slides.--

Drawer slides shall be side mounting full extension with fully enclosed rolling balls and rollers. Concealed slides and bearings, and positive stop. Capacity shall be not less than 35 kg, except capacity shall be not less than 45 kg for heavy duty drawers.

Door guides.--

Sliding door guides shall be continuous, dual channel, metal guides, top and bottom. Bottom guide shall have crowned track.

Shelf supports.--

Shelf supports shall be adjustable, semi-recessed, chrome finished pressed metal, heavy duty standards and support clip, with one inch adjustment increments.

Cabinet hinges.--

Cabinet hinges shall be steel. Length of jamb leaf shall be 64 mm. The type of hinge shall be as shown on the plans.

Cabinet hinge manufacturers shall be Stanley, Hager, McKinney, or equal.

Cabinet catches.--

Cabinet catches shall be self aligning magnetic type in aluminum case with zinc plated steel strike.

Cabinet catch manufacturers shall be Stanley, Hager, McKinney, or equal.

Cabinet pulls.--

Cabinet pulls shall be 8 mm diameter rod, with 33 mm projection and 75 mm center to center fastening.

Cabinet pull manufacturers shall be Stanley, Hager, McKinney, or equal.

FABRICATION.--

Shop assembly.--Nails shall be countersunk and the holes filled, molds shall be neatly mitered and all joints shall be tight and true.

As far as practicable, work shall be assembled at the mill and delivered to the building ready to be set in place. Parts shall be smoothly dressed and interior work shall be belt sanded at the mill and hand sanded at the building. After assembly, work shall be cleaned and made ready for the specified finish.

Veneer sequence matching shall be maintained of cabinets with transparent finish.

All work shall be prepared to receive finish hardware. Finish hardware shall be accurately fitted and securely fastened as recommended by the manufacturer. Finish hardware shall not be fastened with adhesives.

Drawers shall be fitted with dust covers of 6 mm plywood or hardboard above compartments and drawers except where located directly under tops.

Precut openings.--Openings for hardware, appliances, plumbing fixtures, and similar items shall be precut where possible. Openings shall be accurately located and templates used for proper size and shape. Edges of cutouts shall be smoothed and edges sealed with a water-resistant coating.

PART 3.- EXECUTION**INSTALLATION.--**

Cabinets.--Cabinets shall be installed without distortion so that doors and drawers fit openings properly and are accurately aligned. Hardware shall be adjusted to center doors and drawers in openings and to provide unencumbered operation. Installation of hardware and accessory items shall be completed as indicated on the approved drawings.

Laminate tops.--Laminate tops shall be securely fastened to base units and other support systems as indicated on the approved drawings.

Cabinet hardware.--Doors for cabinets shall be equipped with one pair of hinges and one catch per leaf, unless otherwise shown on the plans. Each door leaf shall be equipped with one pull

Drawers up to 610 mm wide shall have one pull and drawers over 610 mm wide shall have two pulls.

SECTION 12-7. THERMAL AND MOISTURE PROTECTION

12-7.01 WATER REPELLENT SEALANT

PART 1.- GENERAL

SUMMARY.--

Scope.--The work shall consist of cleaning and placing a silane sealant on exterior concrete surfaces and on those interior concrete surfaces that will not be covered by insulation, framing, paneling or other construction.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and application instructions shall be submitted for approval.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished with each shipment of water repellent sealant in accordance with Section 6-1.07, "Certificates of Compliance," of the Standard Specifications, and a Materials Safety Data Sheet.

PART 2.- PRODUCTS

Manufacturers.--Water repellent sealer shall be Hydrozo Inc., Enviroseal 40; Tamms Industries, Baracade Silane 40; Sonneborne, Penetrating Sealer 40; or equal.

Water repellent sealant.--

Water repellent sealant shall be a 40 percent minimum, organosilane solution, diluted in a suitable solvent, and shall consist of alkyltrimethoxy silanes with alkyl groups of i-butyl, i-octyl, n-octyl, singularly or in combination.

The water repellent sealant shall be tinted with a fugitive dye which will cause the concrete sealant to be distinguishable on the concrete surface for at least four hours after application, but shall disappear within seven days after application.

PART 3.- EXECUTION

PREPARATION.--

Protection.--Surfaces of other materials surrounding or near the surfaces to receive the water repellent sealant shall be protected from overspray or spillage from the waterproofing operation. Water repellent sealant applied to surfaces not intended to be waterproofed shall be removed and the surfaces restored to their original condition.

Surface preparation.--All surfaces to receive water repellent sealant shall be cleaned with light abrasive blasting. Blasting shall remove all dirt, debris and other deleterious materials, including removal of existing cement matrix. After cleaning, the concrete surfaces shall be air blown to dry and remove loose surface material prior to sealing.

APPLICATION.--

General.--The water repellent solution shall be applied in accordance with manufacturer's application instructions.

Water repellent sealant shall be applied only during periods of weather as recommended by the manufacturer, when the atmospheric temperature is between 4°C and 38°C and for exterior application when wind speed is less than 8 kilometers per hour.

Subject to written approval by the Engineer, the Contractor may provide suitable enclosures to permit concrete sealing during inclement weather.

FIELD QUALITY CONTROL.--

Tests.--Approximately 24 hours after placement of the water repellent sealant, the Contractor shall uniformly dampen the treated concrete surface using a fine water spray. Spray shall completely wet the surface without causing runoff.

After 5 days following sealant application, if required by the Engineer, the Contractor shall spray designated sealed concrete surfaces with a fresh water spray to verify sealant coverage. The water spray shall not penetrate the concrete surfaces, and surfaces determined to lack sufficient sealant coverage shall be resealed.

12-7.02 INSULATION (GENERAL)

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing insulation in accordance with the details shown on the plans and these special provisions.

Insulation materials shall be as specified in these special provisions, and shall be compatible with existing or new materials incorporated in the building.

SUBMITTALS.--

Product data.--A list of materials, manufacturer's descriptive data, location schedule, and time schedule shall be submitted for approval.

The list of materials to be used shall include the trade name, manufacturer's name, smoke developed and flame spread classification, resistance rating and thickness for the insulation materials and accessories.

Schedules.--A location schedule and time schedule shall be submitted for approval.

The location schedule shall show where each material is to be installed.

The Contractor shall provide the Engineer at the jobsite with an accurate time schedule of the areas of the building to be insulated each day. The time schedule shall be submitted 3 working days in advance of the work.

Samples.--Samples of insulation material shall be submitted to the Engineer at the jobsite.

QUALITY ASSURANCE.--

Codes and standards.--All insulating materials shall be certified to comply with the California Quality Standards for Insulating Materials and shall be listed in the Department of Consumer Affairs publication "Consumer Guide and Directory of Certified Insulation Material."

DELIVERY, STORAGE AND HANDLING.--

General.--Insulating materials shall be delivered to the jobsite and stored in a safe dry location with labels intact and legible.

Insulating materials shall be protected from physical damage and from becoming wet or soiled.

In the event of damage, materials shall be repaired or replaced as necessary to comply with these specifications.

PART 2.- PRODUCTS (Not applicable.)

PART 3.- EXECUTION (Not applicable.)

12-7.03 BATT AND BLANKET INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing batt or blanket insulation in accordance with the details shown on the plans and these special provisions.

Batt insulation shall include faced and unfaced batts in walls and ceilings, acoustical batts for sound control and exposed batt or blanket insulation for ceilings and walls.

QUALITY ASSURANCE.--

Laminator's qualifications.--Laminator for bonding polyethylene vapor-retarder to insulating batts shall be approved by the insulation manufacturer.

The name of the laminator shall be submitted with the Product Data.

Codes and standards.--All batt or blanket insulation, including facings such as vapor barriers, shall have a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with UBC Standard No. 8-1.

The flame-spread and smoke density limitations do not apply to facings on batt insulation installed between ceiling joists, or in roof-ceiling or wall cavities, provided the facing is installed in substantial contact with the surface of the ceiling or wall finish.

PART 2.- PRODUCTS

INSULATING MATERIALS.--

General.--Fiberglass batts shall be thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM Designation: C 665.

Wall insulation.--

Wall insulation shall be R-2.3 K•m²/W fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Ceiling insulation.--

Ceiling insulation shall be R-5.3 K•m²/W fiberglass batts with paper-laminate vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type II, Class C.

Acoustical insulation.--

Acoustical insulation shall be 89 mm, unfaced fiberglass insulation batts. Insulation shall conform to ASTM Designation: C 665, Type I.

Exposed insulation.--

Exposed insulation shall be fiberglass batts with bonded polyethylene vapor-retarder membrane on one face. Insulation shall conform to ASTM Designation: C 665, Type I. Exposed insulation for ceilings shall be R-5.3 K•m²/W and R-2.3 K•m²/W for walls.

VAPOR-RETARDERS.--

Paper-laminate vapor-retarder.--

Paper-laminate vapor-retarder shall be kraft paper sheets laminated together with asphalt or other vapor retarding compounds, scrim reinforced at edges of sheets.

Foil-paper vapor-retarder.--

Foil-paper vapor-retarder shall be 0.0076 mm reflective aluminum foil laminated with scrim reinforcing to plastic-coated kraft paper.

Polyethylene vapor-retarder.--

Polyethylene vapor-retarder shall be factory-applied, 0.076 mm, white polyethylene film, a blend of fiberglass and polyester yarn reinforcement, and metallized polyester film laminated with a flame resistant adhesive, and a Class I flame-spread classification.

AUXILIARY INSULATION MATERIALS.--**Insulation tape.--**

Insulation tape shall be as recommended by the insulation manufacturer.

Insulation adhesive.--

Insulation adhesive shall be the type recommended by the insulation manufacturer and complying with the requirements for fire resistance.

FABRICATION--

General.--Polyethylene shall be factory laminated to fiberglass batts or blankets by an applicator approved by the manufacturer of the batts or blankets.

PART 3.- EXECUTION**INSTALLATION.--**

General.--The vapor retarder on faced batts shall be toward the interior and shall be fastened to provide a sealed retarder. Punctures and holes in the retarder shall be repaired.

Unless otherwise shown on the plans or specified elsewhere in these special provisions, insulation shall be kept 75 mm to 100 mm clear of lighting fixtures and heat producing electrical appliances and equipment.

Installing batt type insulation.--Insulation batts shall be installed to completely fill the space between framing members. Apply a single layer of insulation of required thickness, unless otherwise shown on the plans or required to make up total thickness. Installation shall conform to the manufacturer's recommendations and these special provisions.

Joints in exposed insulation shall be sealed by lapping not less than 100 mm. Exposed insulation shall be fastened to framing at top, end and bottom, at perimeter of wall openings and at lap joints.

Overlapping joints shall be sealed with insulation adhesives as recommended by vapor retarder manufacturer's printed directions. Butt joints and fastener penetrations shall be sealed with insulation tape of the type recommended by the vapor retarder manufacturer. Joints at pipes, conduits, electrical boxes and similar items penetrating the vapor retarder shall be sealed.

12-7.04 THERMOPLASTIC MEMBRANE ROOFING (KEE)**PART 1.--GENERAL****SUMMARY.--**

Scope.--This work shall consist of furnishing and installing fully adhered single-ply sheet roofing system in accordance with the details shown on the plans and these special provisions.

The roof system shall include rigid roof insulation, protection board, membrane, bonding adhesive, flashing, fasteners and other materials required, but not necessarily mentioned, which provide a complete and waterproof assembly meeting the performance requirements specified herein.

References.--The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM E 108 (1996) Fire Tests of Roof Coverings
FM A/S4470 (1986; R 1992) Class I Roof Covers
FM DS/1-28 (1996) Wind Loads to Roof Systems and Roof Deck
FM DS/1-29 (1996) Above-Deck Roof Components FM P7825 (1999) Approval Guide
UL RMSD (1997) Roofing Materials and Systems Directory
UL 790 (1997) Fire Resistance of Roof Covering Materials

PERFORMANCE REQUIREMENTS.—

General.—The roof cover assembly shall prevent the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure. Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

Fire Safety.—The roof covering assembly shall comply with ASTM E 108 Class 1A or UL 790 Class A classification; and be listed as part of Fire-Classified roof deck construction in the UL RMSD or Class I roof deck construction in the FM P7825. UL approved components of the roof covering assembly shall bear the UL label.

Wind Uplift.—The roof covering assembly shall be rated Class I-90 in accordance with FM P7825 capable of withstanding an uplift pressure of 4.30 kilopascals per square.

SUBMITTALS.--

Product data.— Manufacturer's descriptive data, Factory Mutual test reports, product specifications, storage requirements and installation instructions shall be submitted for approval.

Working drawings.—Working drawings for roofing system shall include plans, elevations, sections, details, and attachments to other work. Include base flashings, membrane terminations, and insulation fastening pattern.

Samples.—Three samples of the following products shall be submitted for approval:

Roofing sheet of color specified, 300-by-300 mm square, including T-shaped side and end lap seam.

Roof insulation, 300-by-300 mm square.

QUALITY ASSURANCE.--

Certificates of Compliance.—Certificates of Compliance shall be furnished for the roofing membrane in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Single source responsibility.—Roofing materials shall be obtained from a single manufacturer. Secondary materials shall be as recommended by the thermoplastic roofing manufacturer.

Installer's qualification.—Membrane roofing installer shall be approved and certified by the thermoplastic roofing manufacturer as qualified to install this type of roofing. A copy of the manufacturer's certification shall be given to the Engineer prior to the installation of any roofing materials.

Pre-roofing conference.—After approval of submittals and prior to installation of roofing or associated work, the Contractor shall convene a pre-roofing conference with the installer, roofing manufacturer and the Engineer. Discussions and agreements shall be recorded and copies furnished to each participant. Advance notice of the meeting shall be given in writing to each participant at least 72 hours prior to the meeting.

PROJECT CONDITIONS.--

Weather.--Do not install membrane sheet roofing during high winds or inclement weather, or when there is ice, frost, moisture, or visible dampness on the substrate surface. Unless recommended otherwise by the membrane sheet manufacture, do not install membrane sheet when air temperature is below 4 degrees C of the dewpoint.

Roofing work shall proceed when existing and forecasted weather conditions permit the work to be performed in accordance with the manufacturer's recommendations and warranty requirements.

DELIVERY, STORAGE AND HANDLING.--

Delivery, storage and handling.--Materials shall be delivered to the job site in manufacturer's original unopened packages clearly labeled with manufacturer's name and identification numbers. Materials shall be stored in strict accordance with the manufacturer's printed storage requirements. Material shall be handled in such a manner as to prevent damage and premature curing.

WARRANTY.--

The Contractor shall furnish the membrane sheet manufacturer's 15 year warranty for the roofing system, including insulation, flashings, and accessories. The warranty shall run directly to the Department.

The warranty shall state that: When within the warranty period the membrane sheet roofing system becomes non-watertight, splits, tears, or separates at the seams because of defective materials and workmanship, the repair or replacement of defective materials and correction of defective workmanship shall be the responsibility of the roofing manufacturer; When the manufacturer or the manufacturer's approved applicator fail to perform repairs within 72 hours of notification, emergency repairs performed by others will not void the warranty. Damage to the thermoplastic roofing system caused by sustained winds having a velocity of 90 kilometers per hour or less is covered by the warranty.

PART 2.- PRODUCTS

GENERAL.--

Performance.--Roofing materials shall be provided which are recognized to be of generic type indicated and tested to show compliance with indicated performance.

Compatibility.--Products which are recommended by the manufacturer shall be fully compatible with the substrates used.

MANUFACTURERS.--

Available manufacturers.--Subject to compliance with the specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to, Flex Membrane International, Cooley Engineered Membrane; Firestone Building Products Company, or equal.

MATERIALS.--

Membrane.--

Roofing membrane shall be thermoplastic elvaloy alloy of keytone ethylene ester (KEE), polyester reinforced, 1.1 mm (45 mil) nominal thickness for fully adhered application.. Width and length of sheet shall be as recommended by the manufacturer. Color shall be white. Thermoplastic sheet shall have the following values when tested for the listed properties in accordance with the listed test methods:

Property	Value	Test Method Designation
Thickness, min., mm	1.02	ASTM D 75
Breaking Strength, min., N	668	ASTM D 751 A-Grab Method
Elongation, min., percent	15	ASTM D 751 A-Grab Method
Tear Strength, min., N (Tongue tear 200 by 200 mm sample)	267	ASTM D 751
Low Temperature Bend at -40 degrees C	Pass	ASTM D 2136
Linear Dimension Change, max. percent (1 hour at 100 degrees C)	2.0	ASTM D 1204
Ply Adhesion, min., N/m	.452	ASTM D 413 Machine Method
Hydrostatic Resistance, min., MPa	1.21	ASTM D 751 Method A
Ozone Resistance (2 x Magnification)	No cracks	ASTM D 1149 Bent Loop Method, Method B Exposure Method D5181
Accelerated Weather Resistance, 5,000 Hours (7 x Magnification)	No cracking or crazing, or discoloration negligible	ASTM D 2565 Type BH2 or ASTM G 53 Type UVB3
Permeance, max., perms	0.055	ASTM E 96, Procedure BW

Auxiliary materials.—

Bonding Adhesive.--

Bonding adhesive shall be manufacturer's standard water based type for membrane, and solvent-based type for base flashings.

Flashing and flashing accessories.--

Flashing, including perimeter flashing, flashing around roof penetrations, shall be thermoplastic alloy coated metal, thermoplastic membrane, or membrane premolded corners or boots for use around penetrations as recommended as standard by the membrane sheet manufacturer's printed instructions. Thermoplastic alloy coated metal base flashings shall be field fabricated where required. Sheet metal base flashings that will contact the membrane shall be turned under 13 mm to form a hem.

Miscellaneous accessories.—

Miscellaneous items shall include but not be limited to pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, fasteners, cover strips and pressure treated nailer strips.

Rigid roof insulation.--

Rigid roof insulation shall be multilayer, preformed board roof insulation having thermal resistance or thickness as shown on the plans.

Composit Boards.--ASTM C 1289; Type III, polyisocyanurate insulation board faced one side, fibrous felt or glass fiber mat membrane on other side; Type V, oriented strand board or wafer board on one side and fibrous felt or glass fiber mat membrane on the other.

Insulation tape.--

Insulation tape shall be as recommended by the insulation manufacturer.

Wood nailers.--

Wood nailers shall be douglas fir, pressure treated.

PART 3.- EXECUTION

PREPARATION.--

General.--The roof deck substrate shall be completely installed prior to installation of the roofing membrane. The roof deck surface shall be swept clean and be free of sharp edges, cracks, debris, oil and grease and otherwise suitably prepared to accept the roofing membrane.

EXAMINATION.—

The Contractor shall examine substrates, areas, and conditions, with installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.

Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Section 12-5 Section "Steel Deck."

INSTALLATION.—

Insulation installation.--The Contractor shall coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

The Contractor shall comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

One or more layers of insulation shall be installed under area of roofing to achieve required thickness. Where overall insulation thickness is 50°mm or greater, the Contractor shall install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 150°mm in each direction.

Surface of insulation shall be trimmed where necessary at roof drains so completed surface is flush and does not restrict flow of water.

Long joints of insulation shall be installed in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Gaps exceeding 6°mm shall be filled with insulation.

The Contractor shall cut and fit insulation within 6°mm of nailers, projections, and penetrations.

Mechanically Fastened Insulation.--Each layer of insulation shall be installed and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

Insulation shall be fastened according to requirements in FMG's "Approval Guide" for specified performance requirements.

Insulation shall be fastened to resist uplift pressure at corners, perimeter, and field of roof.

Fasten according to requirements in FMG's "Approval Guide" for specified performance requirements.

Mechanically Fastened and Adhered Insulation.—The first layer of insulation shall be secured to deck substrate using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

Subsequent layers of insulation shall be installed in a solid mopping of hot roofing asphalt, applied within plus or minus 14 deg C of equiviscous temperature.

Adhered roofing membrane installation.—

General.--Roofing membrane shall be installed over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

Sheet shall be installed according to ASTM D 5036.

Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

Bonding Adhesive.--Bonding adhesive shall be applied to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Bonding adhesive shall not be applied to splice area of roofing membrane.

Roofing membrane shall be adhesively fastened securely at terminations, penetrations, and perimeter of roofing.

Roofing membrane shall be applied with side laps shingled with slope of roof deck where possible.

Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

Lap edges shall be tested with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.

Field strength of seams shall be verified a minimum of twice daily and repair seam sample areas.

Tears, voids, and lapped seams shall be repaired in roofing membrane that does not meet requirements.

Sealant or mastic bed shall be spread over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

Flashing installation.—Thermoplastic alloy coated metal base shall be installed prior to installing thermoplastic membrane. Install flashing in accordance with printed application instructions of membrane sheet manufacturer. Fully adhere membrane base flashing to substrate using bonding adhesive. Extend base flashing not less than 200 mm above roofing surface. Where membrane flashing terminates under a metal reglet, caulk reglet with polyurethane or poly sulfide sealant. Provide premolded corners to complete flashings of curbs, parapets, and other vertical surfaces and prefabricated pipe boots for pipe penetrations where possible. Pitch pockets shall not be used.

Expansion joints installation.—Prefabricated covers or membrane flashing shall be installed over the expansion joints in accordance with membrane sheet manufacturer's printed instructions.

FIELD QUALITY CONTROL.—

Final Roof Inspection.-- Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to the Engineer.

Notify the Engineer 48 hours in advance of date and time of inspection.

Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

PROTECTING AND CLEANING

Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

12-7.05 ROOF SPECIALTIES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing roof specialties in accordance with details shown on the plans and these special provisions.

Roof specialties shall include roof hatches and prefabricated curb and equipment support units.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, rough-in diagrams, installation instructions and general product recommendations shall be submitted for approval.

Samples.--Two samples, minimum 200 mm square, of each exposed metal and plastic sheet materials, and 2 samples, minimum 600 mm long, of formed or extruded metal member each color and finish specified shall be submitted for approval.

Coordination drawings.--Coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping or conduit, shall be submitted for approval. Drawings shall indicate dimensions and locations of items provided in this special provision, together with relationship and methods of attachment to adjacent construction and to mechanical and electrical items.

QUALITY ASSURANCE.--

Labels.--Units shall be provided which have been tested, listed, and bear the label of UL, FM or other recognized testing agency.

Codes and standards.--Prefabricated units shall conform to the requirements of SMACNA, "Architectural Sheet Metal Manual," details for fabrication of units, including flanges and cap flashing to coordinate with types of roofing involved.

PART 2.- PRODUCTS

General.--Manufacturer's standard units, modified as necessary, shall be provided to comply with the contract requirements. Each unit shall be shop fabricated to the greatest extent possible.

MATERIALS.--

Sheet steel.--

Sheet steel shall be structural quality conforming to the requirements of ASTM Designation: A 570.

Galvanized sheet metal.--

Galvanized sheet metal shall be commercial quality, conforming to the requirements of ASTM Designation: A 446, G90 hot dipped galvanized, and mill phosphatized.

Stainless steel.--

Stainless steel shall conform to ASTM Designation: A 167, Type 302/304, with annealed finish. Stainless steel shall be tempered as required for forming and performance.

Aluminum sheet.--

Aluminum sheet shall conform to the requirements of ASTM Designation: B 209, tempered as required, anodized finish, except furnish mill finish where field painting is required.

Extruded aluminum.--

Extruded aluminum shall be the manufacturer's standard extrusions of sizes and profiles required, clear anodized finish unless otherwise shown.

Insulation.--

Insulation shall be the manufacturer's standard rigid or semi-rigid board of glass fiber and shall be the thickness required.

Wood nailers.--

Wood nailers shall be softwood, pressure treated with copper naphthenate, pentachlorophenol, or water-borne arsenicals (ACA, CCA or ACZA); not less than 50 mm nominal thickness.

Fasteners.--

Fasteners shall be the same metal as the metal to be fastened, or other non-corrosive metal as recommended by the unit manufacturer. Finish of the fastener shall be the same finish as the metal being fastened.

Bituminous coating.--

Bituminous coating shall be as recommended by the unit manufacturer for the use specified.

Gaskets.--

Gaskets shall be tubular or fingered design of neoprene or polyvinyl chloride as recommended by the unit manufacturer.

PREFABRICATED ROOF HATCHES.--

General.--Cover for roof hatch or scuttle shall be 2.3°mm aluminum, welded to support a live load of 200 kilograms per square meter and beaded flange. Insulation shall be glass fiber, not less than 25 mm in thickness, fully covered by metal liner. Unit shall have a roof flange for attaching to roof deck. Curb insulation shall be fiberboard or glass not less than 25 mm thick. Unit shall be equipped with hinges, positive latch with turn handles, inside and outside, and padlock hasp on inside, with gaskets. Cover shall be equipped with automatic hold open arm with handle to permit easy release.

Curb height shall be not less than 230 mm, except where slope of roof exceeds 2%, curb shall be tapered to result in level top installation.

Damper handle shall be removable, designed to extend to approximately 1.2 meters above the finished floor.

PREFABRICATED CURB AND EQUIPMENT SUPPORTS.--

General.--Curb and equipment support shall conform to the loading and strength requirements of the equipment to be supported. Dimensions shall conform to the dimensions shown on the coordination drawings of equipment to be supported. Unit shall be fabricated from sheet steel conforming to ASTM Designation: A 570 and galvanized after fabrication.

Where roof slope is more than 2%, curb or equipment supports shall be fabricated with height tapered to provide a level installation.

PART 3.- EXECUTION**INSTALLATION.--**

General.--Prefabricated units shall be installed in accordance with the manufacturer's instructions and approved coordination drawings.

Installation of the units shall be coordinated with installation of the roof decking and other substrates to receive accessory units, vapor barriers, insulation, roof and flashing materials.

Units shall be securely fastened to supporting members, adequate to withstand all lateral, inward or outward loading pressures.

Where metal surfaces are to be installed in contact with non-compatible metals or other corrosive substrates, including wood decking, bituminous coatings shall be applied to metal surfaces.

Except as noted above, roof flanges shall be set in a thick bed of roofing cement to form a watertight seal.

Operational testing.--Units with operational components shall be fully tested. Joints and hardware shall be cleaned and lubricated. All units shall be adjusted for proper operation.

CLEANING AND PROTECTION.--

General.--All exposed metal and plastic surfaces shall be cleaned in accordance with the manufacturer's instructions. Damaged metal coatings shall be repaired.

12-7.06 THROUGH-PENETRATION FIRESTOPPING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing firestopping materials at penetrations in fire-rated walls, floors, and ceilings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--A list of materials, manufacturer's descriptive data, and location schedule shall be submitted for approval.

Descriptive data shall include trade names, manufacturers' names, complete information on the materials to be applied, California State Fire Marshal Listing, the material thickness for the required fire resistance ratings, and the manufacturer's printed instructions for installation. Manufacturer's assembly shall be California State Fire Marshal approved.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished with each shipment of firestopping materials in accordance with Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE AND HANDLING.--

Delivery.--Materials to be applied shall be delivered in original unopened packages. Packages shall be identified by the manufacturer's label and shall bear proper labels for fire resistance classification.

Storage.--Materials shall be stored above ground, under cover, and in a dry location until ready for use. Packages which have been exposed to moisture before use shall be discarded.

PART 2.- PRODUCTS

Wrap strip.--

Wrap strip shall be nominal 6 mm thick intumescent elastomeric material in 50 mm wide strips, faced one side with aluminum foil, and rated for use in 1-hour and 2-hour fire-rated systems.

Packing material.--

Packing material shall be polyethylene backer rod or nominal one inch thickness of tightly packed ceramic (alumina silica) fiber blanket, mineral-wool batt or glass fiber insulation material.

Fire safing insulation.--

Fire safing insulation shall be inorganic 56 kilograms per cubic meter minimum density, non-combustible fiber insulation conforming to Federal Specifications HH-1-521F, when tested in accordance with ASTM Designation: E 118 and ASTM Designation: E 136 for 3 hour fire resistance.

PART 3.-EXECUTION.--

Installation.--Firestopping materials shall be installed to conform to the requirements of the California State Fire Marshal Listing and the manufacturer's recommendations.

12-7.07 SHEET METAL FLASHING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of fabricating, furnishing and installing sheet metal flashing in accordance with the details shown on the plans and these special provisions.

Sheet metal shall include metal flashings, counterflashings, straps, gutters, downspouts, roof jacks, gravel stops, reglets, copings, scuppers, conductor heads, and screen type vents.

Alternatives.--Premolded roof flashings may be used in lieu of sheet metal flashings where shown on the plans.

QUALITY ASSURANCE.--

Codes and standards.--Sheet metal work shall in accordance with the requirements in the latest edition of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "Standard Practice in Architectural Sheet Metal Work."

PART 2.- PRODUCTS

MATERIALS.--

Galvanized sheet steel.--

Galvanized sheet steel shall conform to ASTM Designation: A 653/A 653M with G 90 [Z275] coating, not less than 0.71 mm (24-gage), unless otherwise shown on the plans. Surfaces to be painted shall not have factory coatings on galvanizing that cannot be removed by paint thinner.

Sheet aluminum.--

Sheet aluminum shall be not less than 0.81 mm thick, mill finish, 3003-H14 alloy, conforming to ASTM Designation: B 209M.

Sheet lead.--

Sheet lead shall be not less than 1.6 mm thick, conforming to ASTM Designation: B 749.

Premolded roof flashing.--

Premolded flashing shall be premolded neoprene or ethylene propylene diene monomer (EPDM) flashing, resistant to ozone and ultraviolet. Units shall have overlapping tab to flash the seam.

Hardware and fastenings.--

Hardware and fastening for premolded roof flashings shall be stainless steel.

Solder.--

Solder shall conform to ASTM Designation: B 32, Alloy Grade Sn50.

Soldering flux.--

Soldering flux shall be acid type, conforming to Federal Specification: O-F-506C, Type I, Form A.

Insect screen.--

Insect screen shall be industrial wire cloth and screen, medium grade, 18 mesh, 0.43 mm diameter, 1 mm openings, plain weave, galvanized steel conforming to ASTM Designation: E 437.

Lap joint sealant.--

Lap joint sealant for concealed locations shall be a non-drying butyl.

Flashing cement.--

Flashing cement shall be a bituminous plastic cement, asbestos free, conforming to ASTM Designation: D 4586, Type II.

Sealant.--

Sealant for exposed locations shall be a silicone sealant conforming to ASTM Designation: C 920.

Primer.--

Primer shall be as recommended by the sealant manufacturer.

Coal tar paint.--

Coal tar paint shall be coal-tar epoxy coating conforming to U.S. Corps of Engineers Specification: C-200 or Steel Structures Painting Council Paint Specification: SSPC-16-68T.

FABRICATION.--

General.--Sheet metal shall be assembled to Sheet Metal and Air Conditioning Contractors National Association Standards.

Sheet metal shall be formed to the sizes, shapes and dimensions shown on the plans or as specified herein with angles and lines straight, sharp and in true alignment. The number of joints shall be kept to a minimum.

Angle bends and folds for interlocking the metal shall be made with full regard for expansion and contraction to avoid buckling or fullness in the metal after it is installed.

Joints in sheet metal work shall be closed watertight unless slip joints are specifically required. Watertight joints shall be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Watertight joints in aluminum or between aluminum and other metals shall be sealed with acrylic sealant.

Sheet metal joints to be soldered shall be cleaned with steel wool or other means, pre-tinned and soldered watertight.

All joints shall be wiped clean of flux after soldering. Acid flux shall be neutralized by washing the joints with sodium bicarbonate.

Flashings shall have a 45 degree drip return at bottom edges. Unless otherwise shown on the plans, counterflashing shall extend not less than 100 mm over roofing or other materials protected by the counterflashing and shall be arranged so that roofing or materials can be repaired without damage to the counterflashing. Where reglets are indicated, counterflashing shall be fastened by lead wedges or snap-in flashing.

PART 3.- EXECUTION

PREPARATION.--Surfaces to receive sheet metal shall be clean, smooth and free from defects.

PROTECTION.--Aluminum surfaces to be in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

INSTALLATION.--

Roof penetration flashings.--All pipes, ducts, vents and flues passing through roofs shall be made waterproof with flashings of storm collars or counterflashings.

Roof penetration flashings shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Size and shape shall be as shown on the plans.

On built-up roofing, 2 flashings shall be furnished for each pipe, vent or flue through roof. Flashings shall be constructed so that the lower flashing shall sit directly on the roof deck, with the top flashing set over it on top of the roof felts.

The lower flashing shall be galvanized sheet metal, 0.71 mm (24-gage), and extend 150 mm minimum from outside of the pipe in all directions and 38 mm above the top of the roofing.

The top flashing shall be galvanized sheet steel or sheet lead as shown on the plans.

Hung gutters.--Hung gutters shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Gutters shall be size and shape as shown on the plans.

Gutters shall be fabricated in sections not less than 3 meters in length. Use sections as long as practicable for lengths over 3 meters.

Joints shall be lapped at least 38 mm, rivet and solder watertight. Butt type expansion joints, 19 mm wide, shall be provided at midpoint between down spouts and where expansion joints occur in the structure.

Downspouts.--Downspouts shall be fabricated from galvanized sheet steel, not less than 0.71 mm (24-gage). Size and shape shall be as shown on the plans.

Downspouts shall be installed as shown on the plans, secured to the wall with straps near top, bottom and at intermediate points not more than 2.4 meters apart. Straps shall extend 50 mm out on wall and be secured with suitable anchors.

Unless otherwise shown on the plans, the lower end of downspout shall terminate with mitered 45 degree elbow.

Premolded roof flashings.--Premolded roof flashings shall be installed in accordance with the manufacturer's instructions.

Gravel stops.--Gravel stops shall have upstanding lip, an apron with drip edge and 100 mm minimum width roof flange. Joints between lengths shall be 13 mm wide sliding joints with 305 mm long internal sleeves set in plastic cement. Corners shall be mitered and soldered. Gravel stops shall be set in 6 mm thick bed of plastic cement and stagger nailed at 75 mm centers on the roof flange. Nails shall be 25 mm from the edge of the roof flange. Blind clips of galvanized steel shall be provided.

After metal work is completed and watertight, flashings and gravel stops shall be covered by one of the following methods:

1. The top of the stop flanges and inside the upstanding lip at the joints shall be cleaned with an acid etching detergent, rinsed and dried. A 13 mm thick coat of plastic cement shall be applied on the roof flange and onto the roofing at least 100 mm. A 13 mm thick coat of plastic cement shall be applied 100 mm wide on the upstanding lip at the joints.

A hot mopping of roofing asphalt or a uniform coating of plastic cement shall be applied, over which shall be laid Type IV asphalt saturated felt strips, 255 mm and 330 mm wide, in 2 layers over the flange of the stops feathered out onto the roofing.

12-7.08 SEALANTS AND CAULKING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and applying sealants and caulking which are required for this project, but not specified elsewhere, in accordance with the details shown on the plans and these special provisions.

Related work.--Pourable polyurethane joint sealant shall conform to the requirements under "Joint Sealant" elsewhere in this Section 12-7.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of compliance shall be furnished for the sealants and caulking in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions for all sealants shall be submitted for approval.

Samples.--Color samples of all sealants shall be submitted for approval. Unless otherwise shown on the plans, colors will be selected by the Engineer from the manufacturer's standard colors.

PART 2.- PRODUCTS

MATERIALS.--

General.--All sealants, primers and accessories shall be non-staining to adjacent exposed surfaces. Products having similar applications and usage shall be of the same type and same manufacturer. Gun consistency compound shall be used unless otherwise required by the job conditions.

Acrylic sealant.--

Acrylic sealant shall be one compound, solvent release acrylic sealant.

Butyl sealant.--

Butyl sealant shall be one component, skinning type.

Silicone sealant.--

Silicone sealant shall be one component, low modulus building sealant. Sealant shall be tack-free in one hour, shall not sag or flow, shall be ozone resistant and capable of 100 percent extension without failure.

Joint sealant.--

Joint sealant shall be a two-part, non sag polysulfide base, synthetic rubber sealant formulated from liquid polysulfide polymer.

Backer rod.--

Backer rod shall be round, open or closed cell polyurethane. Backer rod shall be sized such that it must be compressed between 25 and 75 percent of its uncompressed diameter during installation in the joint.

Neoprene.--

Neoprene shall conform to the requirements of ASTM Designation: C 542.

PART 3.- EXECUTION

APPLICATION.--

General.--Unless otherwise shown on the plans, sealants shall be applied in accordance with the manufacturer's instructions.

Silicone sealants shall not be used in locations where painting is required.

Butyl sealants shall not be used in exterior applications, and acrylic sealants shall not be used in interior applications.

Sealants shall be applied in a continuous operation for the full length of the joint. Immediately following the application of the sealant, the sealant shall be tooled smooth using a tool similar to that used to produce concave masonry joints. Following tooling, the sealant shall remain undisturbed for not less than 48 hours.

SECTION 12-8. DOORS AND WINDOWS

12-8.01 HINGED DOORS

GENERAL.--This work shall consist of furnishing and installing hinged doors and frames in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions for fire rated assemblies and a door schedule shall be submitted for approval. The door schedule shall include a description of the type, location and size of each door and frame.

PRODUCTS.--

Metal door.--

Metal door shall be flush, seamless steel door factory prepared and reinforced to receive hardware and having cold rolled stretcher leveled sheet steel face sheets not less than 1.2 mm thick (18-gage). Face sheets shall be bonded with thermosetting adhesive to rigid board honeycomb or precured foam core; or face sheets shall be welded to all parts of an assembled grid of cold formed pressed metal stiffeners and framing members located around edges, ends, openings and at all locations necessary to prevent buckling of face sheets. Seams shall be tack welded, filled and ground smooth. Bottom edge and internal stiffeners of grid type core shall have moisture vents. Welds on exposed surfaces shall be ground smooth. Louvered or glazed openings shall be provided where shown on the plans.

Where fire rated doors are required, doors shall be listed and labeled for the fire rating shown on the plans.

Active leaf of double door shall have a full height astragal of 3 mm flat bar or folded sheet strip, not less than 1.5 mm thick (16-gage), welded on the outside of the active leaf.

Door shall be cleaned and treated by the bonderized process or approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Glazing for doors.--

Glazing for doors shall be safety glass as specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions. Glazing shall be not less than 5 mm thick.

Door louvers.--

Door louvers shall be inverted V-type factory primed, galvanized sheet steel louvers. Exterior door louvers shall not be removable from outside of the building. Louvers at exterior doors shall have inside mounted bronze insect screens.

Fire rated louvers.--

Fire rated louvers shall be factory fabricated, multi-blade adjustable fire damper type units of galvanized steel sheet not less than 1.5 mm thick (16-gage) with a 71°C fusible link and removable bronze 16 x 16 mesh insect screen mounted on the inside of the units. Fire rated louvers shall be listed for the fire rating shown on the plans.

Louvers shall be cleaned and treated by the bonderized process or approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Pressed metal frame.--

Pressed metal frame shall be not less than 1.5 mm thick (16-gage) sheet steel with integral stop, mitered corners, face welded and ground smooth corners. Frames shall be reinforced for all hardware and shall be cleaned and treated by the bonderized process or an approved phosphatizing process and then given one factory application of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Frames for fire rated doors shall be listed for the same rating shown on the plans for fire rated doors.

Sealants.--

Sealants shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, multicomponent, Federal Specification: TT-S-227.

EXECUTION.--

INSTALLATION.--Doors and frames shall be installed rigidly, securely, plumb and true and in such a manner that the doors operate freely without rubbing or binding. Clearance between frame and door shall be not more than 3 mm. The exterior frame shall be sealed weathertight.

Pressed metal frames shall be secured with clips and anchors as shown on the plans.

Fire rated assemblies shall be installed according to the manufacturer's recommendations.

Fire rated assemblies shall include doors, door frames, automatic smoke-actuated closers, self-closing mechanisms, panic hardware, wire glass, and fire rated louvers. Assemblies shall be approved by the California State Fire Marshal.

PAINTING.--Except for the primer application specified herein, doors and frames shall be cleaned, prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-8.02 ACCESS DOORS

GENERAL.--This work shall consist of furnishing and installing access doors in accordance with the details shown on the plans and these special provisions

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Access doors.--

Access doors shall be factory assembled and factory prime painted steel. Door panel shall be 1.90 mm thick (14-gage) and door frame shall be 1.5 mm thick (16-gage) . The door and frame assembly shall have standard screw driver operated cam locks, concealed springs or continuous piano hinge and inside release handle. Access doors shall be by Babcock-Davis Hatchways, Bar-Co Access Doors, Inryco-Milcor, J.L. Industries, or equal.

EXECUTION.--

INSTALLATION.--Access doors shall be installed in accordance with the manufacturer's recommendations. The access door assemblies shall be painted to the match the color of the adjacent surrounding surfaces.

12-8.03 SECTIONAL OVERHEAD DOORS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing sectional overhead doors in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, roughing-in diagram and installation instructions for each size and type of door shall be submitted for approval.

Manufacturer's descriptive data shall include door panel construction and material thickness, door track size and material thickness, counterbalance spring service life and motor operator specifications.

Materials list shall contain all items proposed to be furnished and installed under this section of these special provisions.

Working drawings shall show details of special components and installations which are not fully dimensioned in manufacturer's descriptive data.

QUALITY ASSURANCE.--

Single source.--Each sectional door shall be provided as a complete unit produced by one manufacturer, including frames, sections, bracket guides, tracks, counterbalance mechanisms, hardware, operators and installation accessories, to suit opening and head room available.

Wind loading.--Design and reinforce section overhead doors to withstand a 960 PA wind load with a midspan deflection not to exceed 1/120 span.

PART 2.- PRODUCTS

MANUFACTURERS.--

Available manufacturers.--Subject to compliance with the specifications, manufacturers offering products which may be incorporated into the work include, but are not limited to the following: Clopay Corp.; Overhead Door Corp.; Raynor Garage Doors.

STEEL SECTIONS.--

Door sections.--

Door sections shall be galvanized commercial quality steel sheets and a minimum of G60 zinc coating complying with ASTM Designation: A 525.

Face sheets shall be not less than 0.86mm (20-gage). Back sheet shall be not less than 0.45 mm (26-gage).

Sections shall be fabricated from a single sheet to provide sections not more than 610 mm high, and nominal 50 mm deep. Meeting horizontal edges shall be rolled to a continuous shiplap, rabbeted. or keyed weather seal, with a reinforcing flange return.

Intermediate and end stiles shall be 1.52 mm (16-gage) galvanized steel welded in place. Intermediate stiles shall be spaced at not more than 1220 mm on center.

Bottom section shall be reinforced with a continuous channel or angle conforming to the bottom section profile.

Insulation.--

Insulation shall be the manufacturer's glass fiber, polystyrene or polyurethane foam type insulation and have an R-Value not less than 1.4 K•m²/W.

Finish.--

Finish shall be the manufacturer's standard baked on polyester or epoxy prime and finish coats, applied to interior and exterior faces.

TRACKS, SUPPORTS. AND ACCESSORIES.--

Door tracks.--

Door tracks shall be the manufacturers standard galvanized steel track system, sized for door size and weight, and designed for the clearances shown on the plans. Complete track assembly shall be provided, including brackets, bracing and reinforcing for rigid support of ball bearing roller guides, for required door type and size.

Track reinforcement and supports.--

Track reinforcement and supports shall be galvanized steel. Tracks shall be reinforced and supported as required for the size and weight of door to provide strength and rigidity, and to ensure against sag, sway and vibration during operation.

Door seals.--

Doors shall have perimeter gasket seals at head and jambs and seal shall have a replaceable vinyl or neoprene bottom seal.

Vision panels.--

Vision panels shall be door manufacturer's standard glazed opening with tempered wire safety glass, metal frame and vinyl or neoprene glazing gasket for water tight construction. The approximate size shall be as shown on the plans.

Louvers.--

Louvers shall be 50 mm deep Z-shaped blades, formed from galvanized sheet steel not less than 0.68 mm thick (24-gage), set in a continuous channel frame, and with a 6 mm mesh bird-screen in a removable frame on inside.

Adjustable louvers.--

Adjustable louvers shall be factory fabricated units of extruded aluminum alloy not less than 2.0 mm thick or galvanized steel not less than 0.91 mm thick (20-gage) with standard "Z" type blades set in a continuous channel frame, with a 6 mm mesh galvanized bird-screen in a removable frame on the inside.

Blades shall have center pivot on 10 mm aluminum rods in stainless steel ball bearings in cadmium plated races.

Adjustable louvers shall be equipped with hand-hold fixed to the operating bar for easy adjustment with wingnut spring tension to lock louvers in desired position.

HARDWARE.--

General.--Hardware shall be heavy-duty, rust-resistant, with galvanized or cadmium-plated or stainless steel fasteners, to suit type of door.

Hinges.--

Heavy steel hinges shall be provided at each end stile and at intermediate stiles, per manufacturer's recommendations for size of door.

Rollers.--

Rollers shall be heavy-duty with steel ball bearings in case-hardened steel races, mounted to suit slope of track. Rollers shall have case-hardened tires.

COUNTERBALANCE MECHANISMS.--**Counterbalance spring.--**

The door shall have a torsion spring counterbalance on a continuous cross header shaft; the entire assembly shall be all-bearing mounted. The spring shall have a rated service life of not less than 25,000 cycles.

ELECTRIC DOOR OPERATORS.--

Door operator shall be heavy duty, commercial type. Motor shall be a 208-volt, 3-phase, high starting torque motor with single reduction worm gear, completely housed and running in an oil bath. Motor shall be of sufficient capacity to raise and lower the door at speed of approximately 0.2 m per second.

Door operator and assembly shall be equipped with solenoid brake, limit switches for upper and lower limits of door travel, emergency hand chain with electrical interlock to break motor circuit when hand chain is engaged, 3-button operating station in a NEMA Type 4 enclosure, and a factory wired NEMA Type 1 control panel.

Control panel shall contain an instrument transformer, reversing magnetic contactor with overload relay, and all necessary control relays and other devices required for complete automatic operation of the door. Motor shall be removable for repair without affecting emergency operation. Motor shall be center mounted or side mounted as shown on the plans.

Reversing door edge.--

Reversing door edge shall be an electrically or pneumatically operated safety device extending across the full width of the bottom of the door which shall cause the door to stop automatically and return to open position upon contact with any obstruction.

PART 3.- EXECUTION

INSTALLATION.--

General.--Door, track, and operating equipment, complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports, shall be installed in accordance with the final drawings, manufacturer's installation instructions and these special provisions.

Vertical track assembly shall be fastened to framing at not less than 610 mm on center. Horizontal track shall be hung from structural overhead framing with angle or channel hangers, welded or bolted into place. Sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track and door operating equipment.

12-8.04 ALUMINUM WINDOWS

PART 1.- GENERAL

SUMMARY.--This work shall consist of furnishing and installing windows in accordance with the details shown on the plans and these special provisions.

Windows shall be commercial (C) grade aluminum prime windows unless otherwise shown on the plans.

Windows shall meet the requirement of NAFS-1, "Voluntary Performance Specification for Windows, Skylights, and Glass Doors," and shall meet the C30 (Commercial) product designation unless otherwise shown on the plans. Windows shall be labeled with the AAMA label.

Finish for windows shall be Architectural Class I, clear anodized finish meeting American Architectural Manufacturer's Association Standard 611 unless otherwise shown on the plans.

Glazing for windows shall be in accordance with the requirements specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions.

CERTIFICATES OF COMPLIANCE.--Certificates of compliance shall be furnished for all windows in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and schedule shall be submitted for approval.

Manufacturer's descriptive data and installation instructions shall show window elevations, plan views, full size sections, anchoring details to all substrates, anchors and hardware.

Installation schedule shall show location, size and type for each window.

PART 2.- PRODUCTS

Door and transom windows.--

Door and transom windows shall be door or door frame manufacturer's standard window framing, glazing stops and glazing accessories.

Fixed windows.--

Fixed windows shall be non-operable glazed panel inserted into a frame to include muntins, glazing stops, and glazing accessories.

Aluminum.--

Aluminum shall be extruded 6063-T5 aluminum alloy.

Screws, fasteners and window accessories.--

Screws, fasteners and window accessories shall be non-corrosive metals compatible with aluminum except guides and rollers may be vinyl and nylon respectively. Finish for locks, operators, strikes, keepers and other metal hardware shall match window finish.

Weatherstripping.--

Weatherstripping shall be continuous, replaceable type, wool pile mounted in metal or double runs of ultraviolet resistant neoprene or vinyl.

Vent screen.--

Vent screen shall be aluminum frame with 18 x 14 mesh aluminum screening and polyvinyl-chloride splines. Screen frames shall be removable from interior of building. Finish of screen frame shall match window finish.

Sealant.--

Sealant shall be single-component, solvent type acrylic, self-leveling, non-sag, conforming to Federal Specification: TT-S-230.

Tape.--

Tape shall be compatible with sealant; Pecora, "B-44 Extra-Seal;" Pittsburg Plate Glass, "Duribbon;" Protective Treatment, "PTU 606;" Tremco, "440 Tape;" or equal.

PART 3.- EXECUTION

FABRICATION.--Frame and sash shall be accurately machined and fitted to hairline joinery that develops the members. Joints shall be factory sealed weathertight.

DELIVERY AND STORAGE.--Windows shall be delivered in original, unopened, unbroken containers, wrappings, or bags with labels bearing the brand name, name of manufacturer or supplier, standard of manufacture, and product description. Windows and accessories shall be stored off the ground, kept dry, fully protected from weather and damage

INSTALLATION.--Window units shall be set straight, level, plumb and in true alignment in prepared openings. Windows shall be centered in openings. Clearance between the window unit and the building framing shall be from 4 mm to 6 mm at the sides and 13 mm at the top. Ventilator sash shall be adjusted after glazing for easy, smooth and proper operation.

The installation shall be flashed and sealed weathertight.

All aluminum surfaces in contact with masonry, steel or other incompatible materials shall be isolated with pressure sensitive tape, zinc chromate primer, bituminous paint or such other material recommended by the window manufacturer and approved by the Engineer.

12-8.05 PRESSED METAL FRAMED WINDOWS**PART 1.- GENERAL**

SUMMARY.--This work shall consist of furnishing and installing pressed metal framed windows in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, working drawings and installation instructions shall be submitted for approval.

PART 2.- PRODUCTS**Framing.--**

Framing shall be pressed metal, not less than 1.52 mm thick (16-gage) with all members square and true, full mitered frame corners and continuous welds at all joints and cover plates. Welds at frame faces shall be ground smooth and flush with surrounding surfaces. All metal surfaces shall be cleaned and factory primed with one coat of metal protective rust inhibitive primer. Primer shall not contain lead type pigments.

Anchors.--

Anchors shall be manufacturer's standard.

Glazing.--

Glazing shall conform to the requirements specified under "Glazing," in Section 12-8, "Doors and Windows," of these special provisions.

Backer rod.--

Backer rod shall be close cell, non-absorbent, non-staining foam rod compatible with sealant.

Sealant.--

Sealant shall be ultraviolet and ozone resistant, gun grade polysulfide or polyurethane, single component. Sealant shall conform to Federal Specification: TT-S-227.

PART 3.- EXECUTION

INSTALLATION.--Frames shall be installed rigidly, securely, plumb and true. Installations shall be sealed watertight and weathertight.

PAINTING.--Except for the primer application specified herein, exposed frame surfaces shall be cleaned, prepared and painted in accordance with the requirements specified under "Painting" in Section 12-9, "Finishes," of these special provisions.

12-8.06 ALUMINUM STOREFRONT SYSTEM**PART 1.- GENERAL**

SCOPE.--This work shall consist of furnishing and installing an aluminum storefront system in accordance with the details shown on the plans and these special provisions.

SYSTEM DESCRIPTION.--Aluminum storefront system shall include frames, storefront doors, glass, glazing accessories, fasteners, frame anchors, and such other components, not mentioned, but required for a rigid, secure, weatherproof, and complete assembly and installation.

Glazing shall conform to the requirements specified under "Glazing" in Section 12-8 "Doors and Windows" to the extent not specified in this section.

Wind load.--The storefront system shall be designed to withstand a 40 pound per square foot wind load in either direction without exceeding specified deflection limits and an allowable stress with a safety factor of 1.65 when tested in accordance with ASTM Designation: E 330, or verified by design calculations.

Deflection of Framing Members.--Limited to 1/240 or an amount that restricts edge deflection of individual glazing lites to 19 mm whichever is less.

Deflection Normal to Wall Plane.--Limit to 1/175 of clear span for spans up to 4.1 m and to 1/240 of clear span spans greater than 4.1 m.

Deflection Parallel to Glazing Plane.--Limit to 1/360 of clear span or 3.2 mm, whichever is smaller.

Thermal Movements.--System shall allow for thermal movements resulting from the following maximum change (range) of 67 deg C to 100 deg C, in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Miscellaneous performance requirements.--The system shall conform to the following performance requirements:

Test	Description	Specification	Remarks
ASTM E 283	Air infiltration	0.06 cubic feet per minute per square foot of fixed area.	
ASTM E 331	Water infiltration	no water penetration at a test pressure of 8.0 pounds per square foot.	
AAMA 1 503	Condensation-Resistance Factor (CRF)	Not Less Than 53	System
AAMA 1 503	Average Thermal Conductance	3.92 W/sq. m x K	System
ASTM E 413	Sound Transmission	Minimum STC=32	System

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, a detailed list of glazing materials, and installation instructions shall be submitted for approval.

Samples.--Three samples for each of the following materials shall be submitted for approval. Material samples shall include a glass sample not less than 150mm square, frame samples of perimeter and intermediate mullion not less than 300mm in length, and fastener samples of each type of fastener to be used in the installation.

Working drawings.--Working drawings and design calculations for fabrication and installation of window framing shall be submitted for approval. Working drawings shall include elevations, detailed sections, anchorages, and glazing details.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California. The expiration date of the registration shall be shown.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of Compliance shall be furnished for bullet resistant storefront system in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Single source responsibility.--Storefront, entrance doors, and accessories shall be obtained fabricated and installed from a single manufacturer.

DELIVERY, STORAGE AND HANDLING.--

General.--Framing members shall be delivered to the site in undamaged condition and stored off the ground in a well drained location, protected from damage, and easily accessible for inspection and handling. Covers shall be provided to protect the materials from corrosion.

Framing members shall be handled in such a manner as to prevent damage due to bending and warping.

PROJECT CONDITIONS.--

Field Measurements.--Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Working Drawings.

Established Dimensions.--Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

WARRANTY.—

Special Assembly Warranty.--Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including, but not limited to, excessive deflection.
2. Noise or vibration caused by thermal movements.
3. Deterioration of metals and other materials beyond normal weathering.
4. Water leakage through fixed glazing and framing areas.
5. Failure of operating components to function properly.

Warranty Period.--10 years from date of Substantial Completion.

PART 2.- PRODUCTS

METALS.—

Available Manufacturers.--Subject to compliance with performance and aesthetic requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

CMI Architectural Products, Inc.; Kawneer; Vistawall Architectural Products or equal.

Aluminum.--Alloy and temper shall be recommended by manufacturer for type of use and finish to meet performance requirements.

Sheet and Plate.--ASTM B 209M.

Extruded Bars, Rods, Profiles, and Tubes.--ASTM B 221M.

Extruded Structural Pipe and Tubes.--ASTM B 429.

Structural Profiles.--ASTM B 308/B 308M.

Welding Rods and Bare Electrodes.--AWS A5.10/A5.10M.

Finish.--Exposed areas of frame components shall be factory finished with a polyvinylidene fluoride over primer as recommended by the manufacturer to provide a minimum one mil dry film thickness. The polyvinylidene fluoride finish shall consist of 2 color coats with a clear topcoat. The paint finish shall be oven baked. Color shall be white.

Steel Reinforcement.--Manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 shall be applied immediately after surface preparation and pretreatment. Surface preparation methods shall conform to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

Structural Shapes, Plates, and Bars.--ASTM A 36/A 36M.

Cold-Rolled Sheet and Strip.--ASTM A 1008/A 1008M.

Hot-Rolled Sheet and Strip.--ASTM A 1011/A 1011M.

FRAMING SYSTEMS

Framing Members.--Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

Construction.--Framing members are one-piece members that are internally slotted at regular intervals.

Brackets and Reinforcements.--Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

Fasteners and Accessories.--Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices. Reinforce members as required to receive fastener threads.

Concrete and Masonry Inserts.--Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

Flashing.--Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

Framing System Gaskets and Sealants.--Manufacturer's standard recommended by manufacturer for joint type.

GLAZING

Glazing shall be tempered glass as specified in Section 12-8 "Glazing." Glass shall contain low emissivity coating to produce the following minimum characteristics:

Max. U-value	1.00
Daylight transmittance	>68 %
Exterior daylight reflectance	8 %
Interior daylight reflectance	8 %
Shading coefficient	0.50
Ultraviolet blockage	>75%

Glazing seals, compounds, setting blocks, shims, tapes, and spacers.--

Glazing seals, compounds, setting blocks, shims, tapes, and spacers shall conform to the requirements specified under "Glazing" in Section 12-8, "Doors and Windows," of these special provisions.

Anchors, accessories, and fasteners.--

Anchors, accessories and fasteners shall be non-corrosive metals compatible with aluminum and steel. Exposed finish shall match adjacent surfaces.

DOORS

Doors.--Manufacturer's standard glazed doors, for manual swing operation.

Door Construction.--**44.5-mm** overall thickness, with minimum **3.2-mm** thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.

Door Hardware.--Door Hardware shall conform to the requirements specified under "Finish Hardware" in Section 12-8, "Doors and Windows," of these special provisions to the extent not specified in this section.

ACCESSORY MATERIALS.--

Joint Sealants.--For installation at perimeter of aluminum-framed systems, as specified under "Caulking and Sealants," Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Bituminous Paint.--Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 0.762-mm thickness per coat.

PART 3.- EXECUTION

Installation.—Alumimum storefront system shall be installed in accordance with the manufacturer's instructions, the approved working drawings, the details shown on the plans and these special provisions.

All broken or cracked glass and glass with scratches which reduce the strength shall be replaced before the completion of the project.

Frames shall be installed rigidly, securely, plumb and true. Frames shall be isolated from dissimilar metals and cementitious materials which could corrode or otherwise damage the frames. Installations shall be sealed watertight and weathertight. Backer rod shall be installed behind all sealant.

Clean-up.--All panes shall be cleaned just before the final inspection. Paint, dirt, stains, labels (except etched labels), and surplus glazing compound shall be removed without scratching or marring the surface of the panes or metal work.

12-8.07 FINISH HARDWARE

PART 1.- GENERAL

SUMMARY.--

This work shall consist of furnishing and installing hardware items for doors in accordance with the details shown on the plans and these special provisions.

Hardware for special doors and frames, if required, shall be as specified under "Hinged Doors" in Section 12-8 "Doors and Windows," of these special provisions.

Hardware assemblies shall comply with the fire code and the disabled accessibility requirements indicated on the plans and specified in these special provisions.

SUBMITTALS.—

Manufacturer's technical information and catalog cuts for each item of door hardware and a door hardware schedule shall be submitted for approval prior to installation.

Manufacturer's catalog cuts shall include catalog numbers, material, grade, type, size, function, design, quality and finish of hardware.

The door hardware schedule shall indicate the location and size of door opening, the door and frame material, and the size, style, finish and quantity of the hardware components required.

FINISHES.—

Hardware shall be provided with standard US 26D metal plated finish.

KEYING INSTRUCTIONS.—

New facilities shall have a building master key system established.

Locks shall have cylinders with figure eight interchangeable cores with six pin barrels. Permanent cores and keys shall be delivered to the Engineer for final installation at completion of project.

The Contractor shall also provide figure eight interchangeable cores for use during construction which shall remain the property of the State.

Locks and cylinders shall be provided with six pin "O" cylinders and blank keys. Cylinders and blank keys shall be delivered to the Engineer for combining of cylinders and cutting of keys.

The Contractor shall provide cylinders for use during construction. Construction cylinders shall remain in place until permanent cylinders are installed. Construction cylinders shall remain the property of the Contractor.

Key bows shall be stamped "State of California" and "Do Not Duplicate."

PART 2.- PRODUCTS.--

GENERAL.—

Door hardware equal in material, grade, type, size, function, design, quality and manufacture to that specified herein may be submitted for approval.

Butt hinges.--

Butt hinges shall be steel, 1 1/2-pair per door unless otherwise specified or shown on the plans. Nonremovable pins shall be provided at outswing exterior doors. Hinge size shall be 114 mm x 114 mm unless otherwise noted.

Standard weight hinges shall be:

Hager	BB 1279
McKinney	TB 2714
Stanley	BB 179
or equal.	

Heavy weight hinges shall be:

Hager	BB 1168
McKinney	T4B 37869
Stanley	BB 168
or equal.	

Mortise locksets, latchsets and privacy sets.--

Mortise locksets, latchsets and privacy sets shall be steel case with 32 mm x 203 mm face plate and 70 mm backset. Door and frame preparation for mortise locksets, latchset and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	35H 6FW 15H
Falcon	LM521 DG
Schlage	L9453R x 06
or equal.	

Lever operated latchset:

Best	35H 0N 15H
Falcon	LM101 DG
Schlage	L9010 x 06
or equal.	

Lever operated privacy set:

Best	35H 0L 15H
Falcon	LM311 DG
Schlage	L9040 x 06
or equal.	

Cylindrical locksets, latchsets and privacy sets.--

Cylindrical locksets, latchsets and privacy sets shall be steel chassis, 54 mm diameter, 70 mm backset. Door and frame preparation for cylindrical lockset, latchsets and privacy sets shall conform to ANSI A115.1.

Lever operated lockset shall be:

Best	93K6 AB 9C
Schlage	D53RD RHO
Falcon	LY501 DG
or equal.	

Lever operated latchset shall be:

Best	93K ON 9C
Falcon	LY101 DG
Schlage	D10S RHO
or equal.	

Lever operated privacy set shall be:

Best	93K OL 9C
Falcon	LY301 DG
Schlage	D40S RHO
or equal.	

Cylindrical dead locks.--

Cylindrical dead locks shall have 25 mm throw bolt with concealed hardened steel inserts and 25 mm diameter bolt housing, 70 mm backset.

Single cylinder dead lock with inside thumb turn shall be:

Best	83T 7K
Falcon	D441
Schlage	B460R
or equal.	

Flush bolts.--

Flush bolts shall be installed at the top and bottom of the inactive leaf of pairs of doors. Provide automatic bolts on UL rated pairs of doors.

Flush bolts for manual operation shall be:

Trimco	3915
Glynn Johnson	FB6
H.B. Ives	457
or equal.	

Flush bolts for automatic operation shall be:

Door Control	840
Glynn Johnson	FB7
H.B. Ives	559
or equal.	

Door closers.--

Parallel arms for closers shall be installed at outswing exterior doors. Closers shall have sprayed finish to match other hardware on door.

Door closers shall be:

LCN	4040
Norton	3501-BF
Dorma	7800
or equal.	

Pushplates and pullplates.--

Pushplates and pullplates shall be 102 mm x 406 mm x 1.52 mm (16-gage). Grips shall be 25 mm diameter with 38 mm standoff and 203 mm center to center fastening, unless indicated otherwise.

Pushplates shall be:

Builders Brass	47-E
Quality	40-5
Trimco	1001-3
or equal.	

Pullplates shall be:

Builders Brass	1618-E
Quality	1515
Trimco	1013-3B
or equal.	

Kickplates.--

Kickplates shall be 254 mm in height x 51 mm less than door width x 1.52 mm (16-gage).

Kickplates shall be:

Builders Brass	37X
Quality	48
Trimco	K0050
or equal.	

Mop plates.--

Mop plates shall be stainless steel, 1.52 mm (16-gage), 152 mm in height x 51 mm less than the door width.

Mop plates shall be:

Trimco
Ives
or equal.

Floor mounted stops.--

Floor mounted stops shall be dome type. The height of the stop shall be determined by the clearance required when a threshold is used or not used.

Stops for openings without thresholds shall be:

Builders Brass	8061
Quality	331
Trimco	1210
or equal.	

Stops for openings with thresholds shall be:

Builders Brass	8063
Quality	431
Trimco	1213
or equal.	

Wall bumpers.--

Wall bumpers base diameter shall be 64 mm with a 25 mm projection.

Bumpers shall be:

Builders Brass	WC9
Quality	302
Trimco	1270CV
or equal.	

Automatic door bottom.--

Automatic door bottom shall be heavy duty, full mortise.

Bottom shall be:

Pemko	434 AR
Zero	360
or equal.	

Thresholds, rain drips, door sweeps and door shoes.--

Thresholds, rain drips, door sweeps and door shoes shall conform to the sizes and configurations shown on plans. Thresholds at door openings with accessibility requirements shall not exceed 13 mm in height.

Threshold, rain drip, door sweep and door shoe manufacturers shall be Pemko, Reese, Zero, or equal.

Threshold bedding sealant.--

Threshold bedding sealant shall conform to Federal Specification: SS-C-153.

Weatherstrip and draft stop.--

Weatherstrip and draft stop shall conform to the sizes and shapes shown on plans. Assemblies shall be UL listed and shall be provided where shown on the plans or as specified in these special provisions.

Weatherstrip and draft stop manufacturers shall be Pemko, Reese, Zero, or equal.

Door signs and name plates.--

Door signs and name plates shall be as specified under "Signs" in Section 12-10, "Specialties," of these special provisions.

PART 3.- EXECUTION

DOORS AND FRAMES.--Doors and frames shall be set square and plumb and be properly prepared before the installation of hardware.

INSTALLATION.--Hardware items shall be accurately fitted, securely applied, and adjusted and lubricated in accordance with the manufacturer's instructions. Installation shall provide proper operation without bind or excessive play.

Hinges shall be installed at equal spacing with the center of the end hinges not more than 244 mm from the top and bottom of the door. Pushplates and door pulls shall be centered 1118 mm from the finished floor. Locksets, latchsets, privacy sets and panic exit mechanisms shall be 1024 mm from the finished floor. Kickplates shall be mounted on the push side of the doors, 25 mm clear of door edges.

Thresholds shall be set in a continuous bed of sealant material.

Door controls shall be set so that the effort required to operate doors with closers shall not exceed 37.8 N maximum for exterior doors and 22.3 N maximum for interior doors. The effort required to operate fire doors may be increased above the values shown for exterior and interior doors but shall not exceed 66.7 N maximum.

Door stops located on concrete surfaces shall be fastened rigidly and securely in place with expansion anchoring devices. Door stops mounted elsewhere shall be securely attached with wood screws or expansion devices as required.

Backing shall be provided in wall framing at wall bumper locations.

The location and inscriptions for door signs and name plates shall be as shown on the plans.

Hardware, except hinges, shall be removed from surfaces to be painted before painting.

Upon completion of installation and adjustment, the Contractor shall deliver to the Engineer all dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions and maintenance guides.

DOOR HARDWARE GROUPS AND SCHEDULE.--Hardware groups specified herein shall correspond to those shown on the plans:

GROUP 1 (Exterior man doors)

- 1 1/2-pair butt hinges
- 1 each mortise lockset
- 1 each floor mounted door stop
- 1 each automatic door bottom
- 1 each weatherstripping
- 1 each door shoe with drip
- 1 each door closure
- 1 each threshold

GROUP 2

- 1 1/2-pair butt hinges
- 1 each cylindrical lockset
- 1 each automatic door bottom
- 1 each kickplate
- 1 each door closure
- 1 each smoke seal

GROUP 3

- 1 1/2-pair butt hinges
- 1 each push and pull plate
- 1 each kickplate
- 1 each wall bumper

GROUP 4

- 1 1/2-pair butt hinges
- 1 each cylindrical lockset
- 1 each door mounted door stop

GROUP 5

- 1 1/2-pair butt hinges
- 1 each cylindrical privacy set
- 1 each wall bumper

GROUP 6

All door hardware provided by door manufacturer.

12-8.08 GLAZING

PART 1.- GENERAL

SUMMARY.---

This work shall consist of furnishing and installing glazing in accordance with the details shown on the plans and these special provisions.

Glazing shall consist of glass for windows, doors and other glazed openings.

All glass shall conform to ASTM Designation: C 1036 and the classifications specified herein and shall be clear glass except as noted.

Safety glass shall be furnished and installed at all locations designated in Consumer Product Safety Commission's Safety Standard For Architectural Glazing Materials 16 CFR 1201.

SUBMITTALS.—

A detailed list of glazing materials including glass, sheet, sealants, tapes, setting blocks, shims, compression seals, and glazing channels shall be submitted for approval. The list shall include a schedule of the materials to be used at each location.

LABELS.—

Each individual pane of heat strengthened or fully tempered glass shall bear an identification label in accordance with ASTM Designation: C 1048.

PART 2.- PRODUCTS

Sheet glass, float glass, or plate glass.--

Sheet glass, float glass, or plate glass shall be Type I, Class 1, Quality q4 or better, double strength for panes to 0.93 m², 5 mm thick for panes between 0.93 m² and 2.6 m², and 6 mm thick for panes over 2.6 m², except as otherwise shown on the plans.

Safety glass.--

Safety glass shall conform to Consumer Product Safety Commission Safety Standard For Architectural Glazing Materials: 16 CFR 1201, and ANSI Standard Z97.1 and shall be one of the following:

Tempered glass.--

Tempered glass shall conform to ASTM Designation: C 1048, Kind FT, Condition A, Type 1, Quality q4 or better.

Wire glass.--

Wire glass shall be Type II, Class 1, Form 1, Mesh m1; 6 mm thick clear polished wire glass with diamond mesh.

Heat Strengthened glass.--

Heat Strengthened glass shall conform to ASTM Designation: C 1048, Kind HS, Condition A, Type 1, Quality q4 or better.

Insulating glass assemblies.--

Insulating glass assemblies shall be double pane units consisting of 2 pieces of glass separated by a spacer and hermetically sealed with double seal sealants. The entrapped air shall be at atmospheric pressure and maintained in a hydrated condition by a drying agent located in the spacer

Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels.--

Seals, caulks, putties, setting blocks, shims, tapes, compression seals, felt, spacers, and channels shall be top grade, commercial quality, as recommended by the glass or sheet manufacturer and shall conform to the requirements in the publications of the Flat Glass Marketing Association.

PART 3.- EXECUTION

INSTALLATION.—

Glazing shall conform to the general conditions and applicable details in the publications of the Flat Glass Marketing Association.

Panes shall be bedded fully and evenly, set straight and square within panels in such a manner that the pane is entirely free of any contact with metal edges and surfaces.

For all panes on the exterior of the building, the glazing on both sides of window panes shall provide a watertight seal and watershed. Seals shall extend not more than 2 mm beyond the holding members. A void shall be left between the vertical edges of the panes and the glazing channel. Weep systems shall be provided to drain condensation to the outside.

Panes in assemblies using extruded gasket glazing shall be set in accordance with the assembly manufacturer's instructions using gaskets and stops supplied by the manufacturer.

Whenever welding or burning of metal is in progress within 4.6 m of glazing materials, a protective cover shall be provided over exposed surfaces.

REPLACEMENT AND CLEANING.—

All broken or cracked glass and glass with scratches which reduce the strength shall be replaced before completion of the project.

Panes shall be kept clean of cement and plaster products, cleansers, sealants, tapes and all other foreign material that may cause discoloration, etching, staining, or surface blemishes to the materials.

Excess sealant left on the surface of the glass or surrounding materials shall be removed during the work life of the sealant.

Solvents and cleaning compounds shall be chemically compatible with materials, coatings and glazing compounds to remain. Cleaners shall not have abrasives that scratch or mar the surfaces.

All panes shall be cleaned just before the final inspection. All stains and defects shall be removed. Paint, dirt, stains, labels (except etched labels), and surplus glazing compound shall be removed without scratching or marring the surface of the panes or metal work.

SECTION 12-9. FINISHES

12-9.01 PORTLAND CEMENT PLASTER

GENERAL.--This work shall consist of installing lath and applying portland cement plaster in accordance with the details shown on the plans and these special provisions.

Plaster shall be 3 coat work. The total thickness of plaster shall be 19 mm unless otherwise shown on the plans. The color and the surface finish shall be as shown on the plans.

PRODUCTS.--

Sand.--

Sand shall be lean commercial quality plaster sand.

Cement.--

Cement shall be portland cement, blended hydraulic cement, or portland cement with a maximum of 15 percent mineral admixture. Portland cement shall be Type II, conforming to ASTM Designation: C 150. Blended hydraulic cement shall be Type IP, conforming to ASTM Designation: C 595. Mineral admixture shall be Class N, Class F or Class C, conforming to ASTM Designation: C 618, except loss on ignition shall not exceed 4 percent.

Lime.--

Lime shall conform to ASTM Designation: C 206.

Color for plaster.--

Color for plaster shall be non-fading, sunproof, and limeproof fine ground synthetic mineral oxide.

Premixed portland cement plaster.--

Premixed portland cement plaster shall be a premixed packaged blend of cement, lime and sand, with or without color, that requires only water to prepare for use as portland cement plaster, may be furnished. Premixed plaster shall be proportioned as specified herein. Packages of premix shall bear the manufacturer's name, brand, weight and color identification.

Metal lath.--

Metal lath shall be self-furring expanded metal diamond mesh with rust inhibitive coating and waterproof vapor barrier backing. Mesh shall weigh not less than 1.8 kg/m².

Metal lath fasteners.--

Metal lath fasteners shall be galvanized or corrosion resistant nails, screws or staples.

Beads, screeds, control joints and accessories.--

Beads, screeds, control joints and accessories shall be galvanized steel, not less than 0.50 mm thickness.

Vent screen.--

Vent screen shall be galvanized sheet steel combination screen and vent with corrosion resistant metal insect screen on the inside.

Water.--

Water shall be potable.

EXECUTION.--

METAL LATH INSTALLATION.--Metal lath, beads, screeds, control joints, vent screens and other metal accessories shall be installed rigidly and securely in place in accordance with the manufacturer's recommendations.

The type, size and spacing of fasteners for fastening the metal lath and accessories shall be as recommended by the metal lath manufacturer for the type of substrate and the location of the lath and accessories.

PLASTER PROPORTIONING AND MIXING.--Materials shall be accurately proportioned and measured for each batch. All batches for a given coat shall be proportioned the same. Plaster shall be proportioned one part cement to between 3 and 5 parts sand by volume, only sufficient water to obtain a workable mix, and a lime plasticizing agent. Not more than 9 kg of dry hydrated lime or lime putty per sack of cement shall be used in the first and second plaster coat. Plaster for finish coat shall contain not more than 42 kg of dry hydrated lime or lime putty per sack of cement. Lime shall not be used if mineral admixture or blended hydraulic cement is used.

Frozen materials shall not be used in the mix.

All plaster mixing ingredients shall be mixed in a mechanical mixer. After all ingredients are in the mixer, the plaster shall be mixed for a minimum of 2 minutes. The mixture shall be uniform in color after mixing. Hand mixing of plaster will be allowed only with the written approval of the Engineer.

Plaster to be colored shall be colored by mixing the coloring ingredient uniformly and homogeneously into the plaster. Color, if used, will be required only in materials for the finish coat.

PLASTER APPLICATION.--Plaster shall not be applied if the ambient temperature is 4°C or less. Plaster shall not be applied to frost covered or frozen surfaces. Surfaces to receive plaster shall be clean.

The coats of plaster shall be applied continuously in one general direction without allowing mortar to dry at the edges.

The first coat shall be applied with sufficient material and pressure to form full keys and good bond and to cover surfaces. Before setting, the first coat shall be cross-scratched to receive the second coat. The first coat shall be moisture cured, without soaking, for not less than 48 hours after application or until covered by the second coat.

The second coat of plaster shall not be placed until the first coat of plaster has set thoroughly or until at least 12 hours after the first coat of plaster has been placed. The second coat shall be brought out to grounds, straightened to a true, even surface, roughened to assure a bond with the finish coat, and made free of imperfections which would reflect in the finish coat. The second coat shall be moisture cured, without soaking, for not less than 48 hours after application.

The third coat of plaster shall not be placed until at least 7 days after the second coat of plaster has been placed. Troweling of the third coat of plaster shall leave the surface smooth and free from rough areas, trowel marks, checks, or other blemishes. The finished surface shall be true and even and shall not vary more than 3 millimeters in 1.5 meters from the required plane. Plaster with cracks, blisters, pits, stains, efflorescence, shadowing, dryouts, or checks will not be accepted. Surfaces shall be clean and sound.

The third coat shall have the type of finish shown on the plans.

After all other related work has been completed, pointing around trim and set work and repairing of damaged portions of plaster shall be done. Repairs and patching shall match surrounding work in texture and appearance.

Plaster coats shall be protected against freezing for a period of 24 hours after application.

12-9.02 GYPSUM BOARD

GENERAL.--This work shall consist of furnishing, installing and finishing gypsum board in accordance with the details shown on the plans and these special provisions.

Where assembly fire ratings are indicated on the plans, construction shall provide the fire resistance in accordance with the applicable standards in the Fire Resistance Design Manual published by the Gypsum Association.

Gypsum board backing for use in restroom and shower areas shall be water-resistant gypsum backing board.

PRODUCTS.--

Gypsum wallboard.--

Gypsum wallboard shall conform to ASTM Designation: C 36/C 36M.

Gypsum backing board.--

Gypsum backing board shall conform to ASTM Designation: C 442/C 442M.

Water-resistant gypsum backing board.--

Water-resistant gypsum backing board shall conform to ASTM Designation: C 630/C 630M.

Gypsum sheathing board.--

Gypsum sheathing board shall conform to ASTM Designation: C 79/C 79M.

Exterior gypsum soffit board.--

Exterior gypsum soffit board shall conform to ASTM Designation: C 931/C 931M.

Joint tape and joint and finishing compound.--

Joint tape and joint and finishing compound shall conform to ASTM Designation: C 475.

Corner beads, metal trim and control joints.--

Corner beads, metal trim and control joints shall be galvanized steel of standard manufacture.

Resilient metal channel.--

Resilient metal channel shall be galvanized sheet steel channels of standard manufacture for reducing sound transmission in wood frame partitions.

Fasteners.--

Fasteners shall be gypsum wallboard nails conforming to ASTM Designation: C 514 or steel drill screws conforming to ASTM Designation: C 1002.

EXECUTION.--

DELIVERY AND STORAGE.--Materials shall be delivered in original packages, containers or bundles bearing brand name, applicable standard of manufacture, and name of manufacturer or supplier and shall be kept dry and fully protected from weather and direct sunlight exposure. Gypsum wallboard shall be stacked flat with adequate support to prevent sagging or damage to edges, ends and surfaces.

INSTALLATION.—Gypsum board panels to be installed on ceilings and soffits shall be installed with the long dimension of the panels perpendicular to the framing members. Gypsum board panels to be installed on walls may be installed with the long dimension of the panels either parallel or perpendicular to the framing members. The direction of placing the panels shall be the same on any one wall or partition assembly.

Edges of wallboard panels shall be butted loosely together. All cut edges and ends shall be smoothed as needed for neat fitting joints.

All edges and ends of gypsum wallboard panels shall coincide with the framing members, except those edges and ends which are perpendicular to the framing members. End joints on ceiling and on the opposite sides of a partition assembly shall be staggered.

Except where closer spacings are shown on the plans, the spacing of fasteners shall not exceed the following:

Nails	175 mm
Screws	300 mm
Screws at perimeter of panels for fire resistive assemblies having metal framing	200 mm

Type S steel drill screws shall be used to fasten wallboard to metal framing. Nails or Type W steel drill screws shall be used to fasten wallboard to wood framing. Except as shown on the plans, screws shall not be used in fire resistive assemblies.

Adhesives shall not be used for securing wallboard to framing.

Gypsum wallboard panels shown on the plans for shear wall sheathing or for fire resistive assemblies shall be fastened to all framing members. Gypsum wallboard panels at other locations and gypsum wallboard finish over plywood sheathed shear walls shall be fastened to all framing members except at the following locations:

At internal angles formed by ceiling and walls; ceiling panels shall be installed first with the fasteners terminating at a row 175 mm from the walls, except for walls parallel to ceiling framing. Wall panels shall butt the ceiling panels. The top row of wall panel fasteners shall terminate 200 mm from the ceiling.

At internal vertical angles formed by the walls; fasteners shall not be installed along the edge or end of the panel that is installed first. Fasteners shall be installed only along the edge or end of the panel that butts and overlaps the panel installed first.

Fasteners shall be located at least 10 mm from wallboard panel edges and ends. Nails shall penetrate into wood framing at least 30 mm. Screws shall penetrate into wood framing at least 20 mm. All metal fasteners shall be driven slightly below surface level without breaking the paper or fracturing the core.

Metal trim shall be installed at all free edges of panels, at locations where wallboard panels abut dissimilar materials and at locations shown on the plans. Corner beads shall be installed at external corners. Control joints shall be installed at the locations shown on the plans.

Joints between face panels, the internal angles formed by ceiling and walls and the internal vertical angles formed by walls shall be filled and finished with joint tape and at least 3 coats of joint compound. Tape in the corners shall be folded to conform to the angle of the corner. Tape at joints and corners shall be embedded in joint compound.

Dimples at nail and screw heads, dents, and voids or surface irregularities shall be patched with joint compound. Each patch shall consist of at least 3 coats and each coat shall be applied in a different direction.

Flanges of corner beads, control joints and trim shall be finished with a least 3 coats of joint compound.

Each coat of joint compound shall be feathered out onto the panel surface and shall be dry and lightly sanded before applying the next coat. The finished surfaces of joint compound at the panel joints, internal angles, patches and at the flanges of trim, corner beads and control joints shall be flat and true to the plane of the surrounding surfaces and shall be lightly sanded.

Good lighting of the work area shall be provided during the final application and sanding of the joint compound.

Gypsum wallboard used as backing boards for tile or rigid sheet wall covering or wainscoting shall be water resistant. Joints in backing board shall not be taped or filled and dimples at the fastener heads shall not be patched. Edges of cuts and holes in backing board shall be sealed with a primer or sealer that is compatible with the wall covering or wainscoting adhesive to be used.

Surfaces of wallboard to be textured shall receive an orange peel texture, unless otherwise shown on the plans.

12-9.03 CERAMIC TILE

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing ceramic tile in accordance with the details shown on the plans and these special provisions.

Ceramic tile shall include glazed wall tile, patterned porcelain tile, matte porcelain tile, textured porcelain tile, polished porcelain tile, trim tile, setting materials, grouts and such other materials as maybe required for a complete installation.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, a list of materials to be used, and installation instructions for all materials required for the work shall be submitted for approval.

Manufacturer's descriptive data shall be submitted for each type of tile, mortar bed materials, bond coat materials and additives, and grout materials and additives.

Materials list and installation instructions shall include all products and materials to be incorporated into the work.

Friction reports shall be submitted for tile products to be used on floors and other pedestrian surfaces.

Samples.--Samples shall include 2 individual samples of each type and color of tile and trim to be installed and shall be of the same size, shape, pattern and finish as the tile and trim to be installed.

QUALITY ASSURANCE.--

Single source responsibility.--Each type and color of tile, grout and setting materials shall be obtained from a single source.

Master Grade Certificates.--Each shipment of tile to the project site shall be accompanied by a Master Grade Certificate issued by the tile manufacturer.

Certificates of Compliance.--Certificates of compliance shall be furnished for bond coat materials, setting bed materials and grout in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

DELIVERY, STORAGE AND HANDLING.--

Delivery.--Tile and packaged materials shall be delivered to the job site in sealed, unbroken, unopened containers with the labels intact. Tile containers shall bear the Standard Grade label.

Storage and handling.--Materials shall be stored and handled in such a manner as to prevent damage or contamination by water, freezing or foreign matter.

PROJECT CONDITIONS.--

Protection.--Tile work shall be protected and environmental conditions maintained during and after installation to comply with the reference standards and manufacturer's printed instructions.

Temperatures.--Unless otherwise specified in the manufacturer's installation instructions, the ambient temperature shall be maintained at not less than 10°C nor more than 38°C in tiled areas during installation and for 7 days after completion. Exterior work areas shall be shaded from direct sunlight during installation.

Tile shall not be installed when the temperature of the substrate is greater than 32°C or is frost covered.

Illumination.--Interior work areas shall be illuminated to provide the same level and angle of illumination as will be available during final inspection.

PART 2.- PRODUCTS

MANUFACTURERS.--

Available manufacture's.--Subject to compliance with the specifications, tile shall be American Olean Tile Co., Inc.; Summitville Tiles, Inc.; United States Ceramic Tile Co.; or equal.

GENERAL.--

Ceramic tile.--Ceramic tile shall conform to the requirements in ANSI Standard: A137.1, "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.

Ceramic tile shall conform to the "Standard Grade" requirements.

Tile installation materials.--Tile installation materials shall conform to the requirements in ANSI standard referenced with products and materials indicated for setting and grouting.

Tile color and size.--Tile color shall be as shown on the plans; tile size shall be as indicated on the plans.

Slip resistant tile.--Slip resistant tile shall have sufficient abrasives added such that the static coefficient of friction, wet or dry, shall be not less than 0.6 for walking surfaces and 0.8 for ramps when tested in accordance with ASTM Designation: C 1028.

TILE PRODUCTS.--

Matte porcelain tile.--

Matte porcelain tile shall be machine made, unpolished, dust pressed natural porcelain clay and shall have a plain face. Tile shall have a nominal thickness of 8 mm. Matte porcelain tile shall be slip resistant.

Matte porcelain trim tile shall include cove type base at walls and single piece intersecting cove base at corners.

SETTING MATERIALS.--

Reinforcement.--Reinforcement shall be galvanized welded wire fabric with 50 mm x 50 mm - 1.6 mm x 1.6 mm conforming to ASTM Designations: A 82 and A 185 except for minimum wire size. Reinforcement shall be provided in flat sheets.

Tile bond coat.--

Tile bond coat shall be latex-portland cement bond coat.

Latex-portland cement mortar bond coat shall be a prepackaged mortar mix, conforming to ANSI Standard: A118.4, incorporating a dry acrylic resin, and to which only water is added at the job site. Mortar shall be suitable for exterior use and be labeled for the type of tile to be installed.

GROUTING MATERIALS.--

Tile grout.--

Tile grout shall be latex-portland cement grout.

Latex-portland cement grout shall be a prepackaged grout mix, conforming to ANSI Standard: A118.6, incorporating a dry acrylic resin, and to which only water is added at the jobsite. Grout shall be suitable for exterior use and labeled for the type of tile to be installed.

Grout pigment.--

Grout pigment shall be chemically inert, fade resistant mineral oxide or synthetic type. Color shall be as shown on the plans.

SEALANTS.--

Sealant.--

Sealant for vertical expansion joints shall be a medium modulus silicone or polyurethane. Sealant for horizontal joints shall be a 2-part polyurethane type material with a Shore Hardness of 35 to 45.

Color of exposed sealants shall match color of grout in tile adjoining sealed joints.

MISCELLANEOUS MATERIALS.--

Sand.--

Sand shall be a natural or manufactured sand conforming to ASTM Designation: C 144, except that no more than 10 percent shall pass the No. 150 μ m sieve.

Sealers.--

Sealer for grout shall be a penetrating proprietary compound designed for sealing grout. Silicone sealers shall not be used.

Cement.--

Cement shall conform to ASTM Designation: C 150, Type I.

Hydrated lime.--

Hydrated lime shall conform to ASTM Designation: C 206, Type S, or ASTM Designation: C 207, Type S.

Water.--

Water shall be clean and potable.

Metal edge strips.--

Metal edge strips shall be stainless steel terrazzo strips, 3 mm wide at top edge with integral provision for anchorage to mortar bed or substrate.

MIXING MORTAR AND GROUT.--

Mixing.--Mortar and grout shall be mixed to comply with the requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grout of uniform quality with optimum performance characteristics for application intended.

PART 3.- EXECUTION

PREPARATION.--

General.--Concrete, mortar, or masonry substrate surfaces which are to receive tile shall not vary more than 5 mm in 2.4 m from the required plane and shall be true, plumb at vertical surfaces, and square at intersection edges.

Substrates shall be inspected to insure that grounds, anchors, plugs, recessed frames, bucks, drains, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of the tiles.

INSTALLATION.--

General.--Tile installation shall conform to applicable parts of ANSI 108 Series of the tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" and Tile Council of American, "Handbook for Ceramic Tile Installation."

All tile shall be installed on a bond coat over a setting bed. The setting bed shall be a prepared, dimensionally stable substrate as indicated on the plans.

The back face of the tile shall be free of paper, adhesives, fiber mesh, resins, or other materials affecting the bond of the tile to the bedding material.

Tile sheets shall have permanent edge bonding or temporary mounting materials on the exposed face. Water soluble or absorbent adhesives shall not be used for edge bonding. Temporary mounting materials shall allow observation during tile setting operations.

Tile work shall extend into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as shown on the plans. Work shall be terminated neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

Intersections and returns shall be accurately formed. Cutting and drilling of tile shall be performed without marring visible surfaces. Cut edges of tile abutting trim, finish or built-in items shall be carefully ground to produce straight aligned joints. Tile shall be closely fit to electrical outlets, piping, fixtures and other penetrations such that plates, collars, or covers overlap the tile.

Tile bond coat.--The tile bond coat mortar shall be mixed according to the manufacturer's recommendations. The consistency of the mixture shall be such that ridges formed with the recommended notched trowel shall not flow or slump. Reworking will be allowed provided no water or materials are added. The setting bed surfaces shall be dampened before placing the bond coat as necessary tile installation, but the setting bed shall not be soaked. The setting bed surfaces for epoxy bond coat shall be dry.

The bond coat shall be floated onto the cured mortar bed surface with sufficient pressure to cover the surface evenly with no bare spots. The surface area to be covered with the bond coat shall be no greater than the area that can be tiled while the bond coat is still plastic. The bond coat shall be combed with a notched trowel as recommended by the manufacturer within 10 minutes before installing tile. Tile shall not be installed on a skinned over bond coat.

Installing tiles.--Tile shall be installed in accordance with the manufacturer's instructions and shall be set solid and shall be well bonded to the substrate.

Tile set on a tile bond coat shall be installed in accordance with ANSI Standard: A108.5, and tile set on an epoxy mortar shall be installed in accordance with ANSI Standard: A108.6.

If tiles are cut, the cuts shall be made with saws. Cut edges shall be rubbed with an abrasive stone to bring the edge of the glaze slightly back from the body of the tile. Cuts shall be accurately made to neatly fit the tile in place. Cut edges shall not be butted against other tile. Cut tile shall be at least half the size of a full size tile.

Tile shall completely cover wall areas behind mirrors and fixtures.

Tile shall be installed so that the finished tile surface does not vary more than 3 mm in 2.4 m from the finished tile surface shown on the plans. In no case shall there be offsets in adjoining tiles, low spots on finished tile surfaces that can pond water, or finished tile surfaces that are not plumb or true in the completed tile work.

Tiles shall be firmly pressed into the freshly notched bond coat. Tile on interior surfaces shall be tapped and beat into a true surface and to obtain at least 80 percent coverage by the mortar on the back of each tile. Tile on exterior surfaces shall have 100 percent coverage and shall be back-buttered immediately prior to setting the tile.

If tile is face mounted, the paper and glue shall be removed within one hour after tile is installed and all tiles that do not meet the requirements for joints and surface tolerance shall be adjusted or replaced.

Mortar that exudes into the grout spaces between tiles shall be removed to the bottom of tile.

Joints.--Joints between tile shall be continuous both vertically and horizontally. Joints shall be straight and of uniform and equal width. Where tiles on adjoining surface are the same size, the joints shall align, one with the other. Joint width shall be as recommended by the tile manufacturer.

Grouting tile.--Grout shall be mixed, applied and cured in accordance with the manufacturer's recommendations and ANSI Standard: A108.10 for cement grout and ANSI Standard: A108.9 for epoxy grout.

Spacers, strings, ropes, pegs, glue, paper, and face mounting material shall be removed before grouting. Joints between glazed wall tile shall be wetted if they have become dry. Joints for epoxy mortar shall be dry.

Grouting shall not begin until at least 48 hours after installing tile.

A maximum amount of grout shall be forced into the joints between tiles in accordance with the manufacturer's recommendations. The grout shall be finished to the depth of the cushion for cushion edge tile and finished flush with the surface for square edge tile. All gaps and skips in the grout spaces shall be filled.

Mortar or mounting mesh shall not show through the grouted joints.

The finished grout shall have a uniform color and shall be smooth without voids, pinholes or low spots.

Expansion joints shall be kept free of grout or mortar.

Grout shall be protected from freezing or frost for a least 5 days after installation.

Expansion joints.--Expansion joints shall be installed at the perimeter of all tile floors and at all substrate control joints and changes in the substrate material. Exterior expansion joint spacing shall not exceed 5 m in any direction.

All expansion joints shall be made with sealant over backer rods. The thickness of sealant at the center of expansion joints shall not exceed the width of the joint. Joint edges shall be primed as recommended by the sealant manufacturer.

Edge strips.--Edge strips shall be installed at openings where the threshold has not been shown on the plans, but where tile floor abuts other flooring materials at the same level. Edge strips shall be installed centered under the closed door, or where there is no door, centered in the opening.

Sounding tile.--Tiled surfaces shall be sounded with a metal bar or chain for improperly bonded tile or setting bed. Tile or setting bed that emits a hollow sound shall be replaced.

Replacement.--Cracked, chipped, broken, or otherwise defective tiles shall be removed and replaced. All tiles which differ more than 2 mm in elevation from adjacent tile edges shall be removed and replaced.

Curing.--After the installation of tile and the grouting of joints, the tile and grout shall be cured by keeping the surface continuously damp for at least 72 hours after grouting. Curing materials shall not stain the tile or grouted joints. Curing methods shall not erode away the grout.

After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours.

CLEANING AND PROTECTION.--

Cleaning tile surfaces.--All exposed tile surfaces shall be cleaned of all grout haze upon completion of grouting. Acids and chemicals used to clean tile shall conform to the tile manufacturer's recommendations. Cleaners shall not be harmful to materials on surfaces of abutting floors, walls, and ceilings. Tile work shall be rinsed thoroughly with clean water before and after using acid or chemical cleaners. After cleaning and rinsing, tile surfaces shall be polished using a soft cloth.

Tile work shall be cleaned and polished again immediately prior to completion of the contract. All dirt, grime, stains, paints, grease, and other discoloring agents or foreign materials shall be removed.

Protection.--After grouting, horizontal tiled surfaces shall be closed to traffic, and all tiled surfaces shall be kept free from impact, vibration or shock, for at least 72 hours after.

Tile surfaces damaged by construction operations shall be retiled.

12-9.04 RESILIENT BASE

GENERAL.--This work shall consist of furnishing and installing resilient base in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions, color palette, and samples of resilient base shall be submitted for approval. Samples shall be not less than 50 mm in length.

PRODUCTS.--

Resilient base.--

Resilient base shall be manufacturer's best grade, rubber or vinyl base, with premolded internal and external corner pieces. The height and color shall be as shown on the plans.

Adhesive.--

Adhesive shall be as recommended by base manufacturer.

EXECUTION.--

INSTALLATION.--Bases shall be firmly and totally attached to walls with adhesive and shall be accurately scribed to trim, molding and cabinets. All joints shall be tight fitting. Bases between premolded corners or other termini may be installed continuous or installed using one m minimum standard manufactured lengths. Filler pieces shall be not less than 0.5 m.

12-9.05 RUBBER TILE FLOORING

GENERAL.--This work shall consist of furnishing and installing rubber tile in accordance with the details shown on the plans and these special provisions.

Rubber tile shall consist of floor tile, edger strips, and tile manufacturer's recommended primers and adhesives.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions, color and pattern samples shall be submitted for approval. Samples of tile shall be 500 mm x 500 mm in size.

PRODUCTS.--

Rubber tile.--

Rubber tile shall conform to the requirements of ASTM Designation: F1334, Class IA, and Federal Specification: SS-T-312 Type II, no wax.

Size.--500 mm x 500 mm, 3.5 mm thick.

Hardness.--Hardness shall be not less than required by ASTM F 1344

Wearing Surface.--Textured

Color.--Color shall be as shown on the plans.

Manufacturers.--AFCO-USA, American Floor Products Company, Inc.; Burke Mercer Flooring Products; Nora Rubber Flooring, Freudenberg Building Systems, Inc.; or equal.

Primer, leveling compound crack filler and adhesives.--

Primer, leveling compound crack filler and adhesives shall be waterproof types as recommended by the tile manufacturer.

Edger strips.--

Edger strips shall be commercial quality, stainless steel or aluminum.

EXECUTION.--

PREPARATION.--Before placing adhesives, all surfaces to receive tile shall be made free of localized depressions or bumps. Bumps shall be ground flat. Holes, depressions and cracks shall be filled with crack filler or leveling compound.

Immediately prior to application of the tile flooring, the surface to be covered shall be thoroughly dry, free of paint, oil, grease, mortar, plaster droppings, scaly surfaces or other irregularities and shall be broom clean. Primer, when recommended, shall be thoroughly brushed on the surface at the rate recommended by the adhesive manufacturer and shall be completely dry before the application of adhesives.

The rooms where tile is to be installed shall be maintained at a temperature of at least 21°C for not less than 72 hours before installation, during installation and for 5 days after installation.

APPLICATION.--Tile shall be laid to a true, straight, smooth and even finished surface in accordance with the manufacturer's instructions. Joints shall be tight fitting. Floor covering shall be placed before floor mounted fixtures are installed. After tile has been set, the finished surface shall be rolled and cross rolled with a roller weighing 45 kg or more.

Edger strips shall be installed at free edges.

Where tile patterns between rooms differ, the pattern break at openings shall occur at the centerline of the common wall.

Upon completion of the tile application, all stains, surplus adhesive, dirt and debris resulting from the work shall be removed and the floor left broom clean. Tile shall be protected from damage at all times during construction. As a last order of work, tile shall be washed with soap and warm water, rinsed, and then waxed in accordance with the tile manufacturer's printed instructions. Not less than 2 applications of wax shall be placed on the tile flooring.

12-9.06 PAINTING

PART 1.- GENERAL

SUMMARY.--This work shall consist of preparing surfaces to receive coatings, and furnishing and applying coatings, in accordance with the schedules and details shown on the plans, and these special provisions.

The coatings specified in this section are in addition to any factory finishes, shop priming, or surface treatment specified elsewhere in these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, a materials list, and color samples shall be submitted for approval.

Product descriptive data shall include product description, manufacturer's recommendations for product mixing, thinning, tinting, handling, site environmental requirements, product application and drying time.

Materials list shall include manufacturer's name, trade name, and product numbers for each type coating to be applied.

Color samples shall be manufacturer's color cards, approximately 50 mm x 75 mm, for each color of coating shown on the plans. Color samples for stains shall be submitted on wood of the same species, color, and texture as the wood to receive the stain.

REGULATORY REQUIREMENTS.--Coatings and applications shall conform to the rules for control of volatile organic compound emissions adopted by the air quality control district in the air basin in which the coatings are applied.

SITE ENVIRONMENTAL REQUIREMENTS.--Coatings shall not be applied when the air temperature is below 10°C (20°C for varnishes) or when the relative humidity exceeds 75 percent.

The surface to be coated shall be maintained at a minimum temperature of 7°C for a period of 24 hours prior to, and 48 hours after the application of the coating. Heating facilities shall be provided when necessary.

Continuous ventilation shall be provided during application of the coatings.

A minimum lighting level of 865 lux, measured 1 m from the surface to be coated, shall be provided while surfaces are being prepared for coatings and during coating applications.

DELIVERY, STORAGE, AND HANDLING.--Products shall be delivered to the site in sealed, labeled containers and stored in a well ventilated area at an ambient air temperature of not less than 7°C. Container labeling shall include manufacturer's name, type of coating, trade name, color designation, drying time, and instructions for tinting, mixing, and thinning.

MAINTENANCE STOCK.--Upon completion of coating work, a full 3.8 liter container of each type and color of finish coat and stain used shall be delivered to the location at the project site designated by the Engineer. Containers shall be tightly sealed and labeled with color, texture, and room locations where used, in addition to the manufacturer's standard product label.

PART 2.- PRODUCTS

GENERAL.--The products shall be the best quality grade coatings of the specified types as regularly manufactured by nationally recognized paint and varnish manufacturers that have not less than 10 years experience in manufacturing paints and varnishes. Products that do not bear the manufacturer's identification as the best quality grade product shall not be used. Products for each coating system shall be by a single manufacturer and shall not contain lead type pigments.

Thinners, shellac, fillers, patching compounds, coloring tint, and other products required to achieve the specified finish shall be the manufacturer's best quality and shall be used as recommended.

PART 3.- EXECUTION

INSPECTION.--Surfaces to be coated at the jobsite shall be approved by the Engineer prior to the application of coatings. The Contractor shall notify the Engineer at least 3 working days prior to the application of coatings.

SURFACE PREPARATION.--Surfaces scheduled to be coated shall be prepared in accordance with the following, except that the surfaces not specified herein shall be prepared as recommended by the coating manufacturer.

GENERAL.--Hardware, cover plates, light fixture trim, and similar items shall be removed prior to preparing surfaces for coating. Following the application of the finish coating, the removed items shall be reinstalled in their original locations.

WOOD.--Oil and grease shall be removed by solvent wash. Mildew shall be removed by mildew wash. Surfaces to be coated shall be cleaned of all dirt, excess material, or filler by hand cleaning. Smooth surfaced wood shall be sanded lightly.

A sealer composed of equal parts of shellac and alcohol shall be spot applied to knots, sap, pitch, tar, creosote, and other bleeding substances.

After the application of the prime coat, all nail holes, cracks, open joints, dents, scars, and surface irregularities shall be filled, hand cleaned, and spot primed to provide smooth surfaces for the application of finish coats.

Irregularities in wood surfaces to receive a transparent stain finish shall be filled and hand cleaned after the first coat of stain has been applied. The color of the filler shall match the color of the stained wood.

Irregularities in wood surfaces to receive a clear finish shall be filled and hand cleaned before the application of coatings. The color of the filler shall match the color of the coated wood.

GALVANIZED METAL.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Surfaces shall be cleaned of remaining surface treatments by hand cleaning. New surfaces shall be roughened by hand cleaning or light abrasive blasting.

Abraded or corroded areas shall be hand cleaned and spot coated with one coat of vinyl wash pretreatment. Abraded or corroded areas on new surfaces not scheduled to be painted shall be cleaned by solvent wash, hand cleaned, and given 2 spot applications of zinc rich paint.

STEEL AND OTHER FERROUS METALS.--Oils, grease, and fabrication lubricants shall be removed by solvent wash. Dirt, water soluble chemicals, and similar surface contamination shall be removed by detergent wash or steam cleaning. Mill scale and rust shall be removed by hand cleaning or abrasive blasting.

GYPSUM BOARD.--Holes, cracks, and other surface imperfections shall be filled with joint compound or suitable filler prior to application of coatings. Taped joints and filled areas shall be hand sanded to remove excess joint compound and filler.

CEMENT PLASTER.--New plaster shall be cured a minimum of 14 days before coating. Cracks, holes, and surface imperfections shall be filled with patching plaster and hand textured to match adjacent surfaces.

CONCRETE.--New material shall be cured a minimum of 14 days before coating. Surface dirt and dust shall be removed by brooming, air blast, or vacuum cleaner. Oil and grease shall be removed by steam cleaning. Form release agents, weak concrete, surface laitance, dirt, and other deleterious material shall be removed by sandblasting. Cracks and voids shall be filled with cement mortar patching material.

PREVIOUSLY COATED AND SHOP PRIMED SURFACES.--Dirt, oil, grease, or other surface contaminants shall be removed by water blasting, steam cleaning, or TSP wash. Minor surface imperfections shall be filled as required for new work. Mildew shall be removed by mildew wash. Chalking paint shall be removed by hand cleaning. The surfaces of existing hard or glossy coatings shall be abraded to dull the finish by hand cleaning or light abrasive blasting. Abrasive blasting shall not be used on wood or non-ferrous metal surfaces.

Chipped, peeling, blistered, or loose coatings shall be removed by hand cleaning, water blasting, or abrasive blasting. Bare areas shall be pretreated and primed as required for new work.

DEFINITIONS.--

DETERGENT WASH.--Removal of dirt and water soluble chemicals by scrubbing with a solution of detergent and water, and removal of all solution and residues with clean water.

HAND CLEANING.--Removal of dirt, loose rust, mill scale, excess base material, filler, aluminum oxide, chalking paint, peeling paint, or paint which is not firmly bonded to the surfaces by using hand or powered wire brushes, hand scraping tools, power grinders, or sandpaper and removal of all loose particles and dust prior to coating.

MILDEW WASH.--Removal of mildew by scrubbing with a solution of detergent, hypochlorite-type household bleach, and warm water, and removal of all solution and residues with clean water.

ABRASIVE BLASTING.--Removal of oil, grease, form release agents, paint, dirt, rust, mill scale, efflorescence, weak concrete, or laitance, by the use of airborne abrasives, and removal of loose particles, dust, and abrasives by blasting with clean air.

Abrasives shall be limited to clean dry sand, mineral grit, steel grit, or steel shot, and shall be graded to produce satisfactory results. Unwashed beach sand containing salt or silt shall not be used.

Abrasive blasting shall conform to the requirements of SSPC-SP6-85, Commercial Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

Light abrasive blasting shall conform to the requirements of SSPC-SP7-85, Brush-Off Blast Cleaning, as defined in the Steel Structures Painting Council Manual.

SOLVENT WASH.--Removal of oil, grease, wax, dirt, or other foreign matter by using solvents, such as mineral spirits or xylol, or other approved cleaning compounds.

STEAM CLEANING.--Removal of oil, grease, dirt, rust, scale, or other foreign matter by using steam generated by commercial steam cleaning equipment, from a solution of water and steam cleaning compounds, and removal of all residues and cleaning compounds with clean water.

TSP WASH.--Removal of oil, grease, dirt, paint gloss, and other foreign matter by scrubbing with a solution of trisodium phosphate and warm water, and removal of all solution and residues with clean water.

WATER BLASTING.--High pressure, low volume water stream for removing dirt, light scale, chalking or peeling paint. Water blasting equipment shall produce not less than a 13 800 MPa minimum output pressure when used. Heated water shall not exceed 66°C. If a detergent solution is used, it shall be biodegradable and shall be removed from all surfaces with clean water.

PROTECTION.--The Contractor shall provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains on surfaces not designated to be painted shall be removed by the Contractor at his expense and the original surface restored to the satisfaction of the Engineer.

APPLICATION.--

GENERAL.--Coatings shall be applied in accordance with the printed instructions and at the application rates recommended by the manufacturer to achieve the dry film thickness specified in these special provisions.

Mixing, thinning and tinting shall conform to the manufacturer's printed instructions. Thinning will be allowed only when recommended by the manufacturer.

Coatings shall be applied only when surfaces are dry and properly prepared.

Cleaning and painting shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.

Materials required to be coated shall have coatings applied to all exposed surfaces, including the tops and bottoms of wood and metal doors, the insides of cabinets, and other surfaces not normally visible from eye level.

APPLICATION SURFACE FINISH.--Each coat shall be applied to a uniform finish. Finished surfaces shall be free of surface deviations and imperfections such as skips, cloudiness, spotting, holidays, laps, brush marks, runs, sags, curtains, ropiness, improper cutting in, overspray, drips, ridges, waves, and variations in color and texture.

Each application of a multiple application finish system shall closely resemble the final color coat, except each application shall provide enough contrast in shade to distinguish the separate applications.

WORK REQUIRED BETWEEN APPLICATIONS.--Each application of material shall be cured in accordance with the coating manufacturer's recommendations before applying the succeeding coating. Enamels and clear finishes shall be lightly sanded, dusted, and wiped clean between applications.

Stain blocking primer shall be spot applied whenever stains bleed through the previous application of a coating.

TIMING OF APPLICATIONS.--The first application of the specified coating system shall be applied prior to any deterioration of the newly prepared surface. Metal surfaces shall be prepared and prime coated the same day that cleaning of bare metal is performed. Additional prime coats shall be applied as soon as drying time of the preceding coat permits.

Metal surfaces shall be prime coated within 12 hours of application of vinyl wash pretreatment.

Shellac sealer shall be allowed to dry at least 12 hours before applying the next coat.

Drying time between applications of water borne coatings shall be at least 12 hours.

APPLICATION METHODS.--Coatings shall be applied by brush, roller or spray. Rollers shall be of a type which do not leave a stippled texture in the paint film. Extension handles for rollers shall not be greater than 2 m in length.

If spray methods are used, surface deviations and imperfections such as, overspray, thickness deviations, lap marks, and orange peel shall be considered as evidence that the work is unsatisfactory and the Contractor shall apply the remainder of the coating by brush or roller, as approved by the Engineer.

DRY FILM THICKNESS.--

Vinyl wash pretreatment	0.007 mm to 0.13 mm, maximum.
Bituminous paint	0.1 mm, minimum.
Epoxy polyamide primer	0.1 mm, minimum.
Aliphatic polyurethane enamel	0.05 mm, minimum.
Other primers, undercoats, sealers, and coatings	As recommended by the manufacturer.

BACKPRIMING.--The first application of the specified coating system shall be applied to all wood surfaces (face, back, edges, and ends) of wood materials that are not factory coated, immediately upon delivery to the project site, except surfaces of interior finish woodwork that adjoin concrete or masonry shall be coated with one application of alkyd exterior wood primer before installation.

When clear or stain type coatings are required on millwork, trim, or paneling, varnish, reduced 25 percent by mineral spirits, shall be used for coating the back faces.

All primed metal surfaces in contact with concrete or concrete block exterior walls shall be coated with a bituminous paint on those surfaces in contact with the wall.

PATCHES IN PREVIOUSLY COATED SURFACES.--Where patches are made on surfaces of previously coated walls or ceilings, the entire surface to corners on every side of the patch shall be coated with a minimum of one application of the finish coat.

FINISHING MECHANICAL AND ELECTRICAL COMPONENTS.--Shop primed mechanical and electrical components shall be finish coated in accordance with the coating system entitled, "Shop Primed Steel." Louvers, grilles, covers, and access panels on mechanical and electrical components shall be removed and coated separately.

Interior surfaces of air ducts which are visible through grilles or louvers shall be coated with one application of flat black enamel, to limit of the sight line.

Exposed conduit, piping, and other mechanical and electrical components visible in public areas shall be painted.

Both sides and all surfaces, including edges and back of wood mounting panels for electrical and telephone equipment shall be finish coated before installing equipment.

CLEANING.--Upon completion of all operations, the coated surfaces shall be thoroughly cleaned of dust, dirt, grease, or other unsightly materials or substances.

Surfaces marred or damaged as a result of the Contractor's operations shall be repaired, at his expense, to match the condition of the surfaces prior to the beginning of the Contractor's operations.

COATING SYSTEMS.--The surfaces to be coated shall be as shown on the plans and as specified elsewhere in these special provisions. When a coating system is not shown or specified for a surface to be finish coated, the coating system to be used shall be as specified for the substrate material. The number of applications specified for each coating system listed herein is a minimum. Additional coats shall be applied if necessary to obtain a uniform color, texture, appearance, or required dry film thickness.

SYSTEM 1- CEMENT PLASTER AND CONCRETE.--

- 1 prime coat: concrete and masonry primer
- 2 finish coats: acrylic, exterior enamel, semi-gloss

SYSTEM 2- GALVANIZED METAL.--

1 pretreat coat: vinyl wash pretreatment
1 prime coat: galvanized metal primer
2 finish coats: acrylic, exterior enamel, semi-gloss

SYSTEM 3- GYPSUM BOARD.--

1 prime coat: PVA wall sealer
2 finish coats: acrylic, interior enamel, semi-gloss

SYSTEM 4- SHOP PRIMED STEEL.--

1 prime coat : red oxide ferrous metal primer
2 finish coats: alkyd, exterior enamel, semi-gloss

SYSTEM 5- STEEL AND OTHER FERROUS METALS.--

2 prime coats: red oxide ferrous metal primer
2 finish coats: alkyd, exterior enamel, semi-gloss

SYSTEM 6- STEEL, ALIPHATIC POLYURETHANE.--

1 prime coat: epoxy polyamide primer
2 finish coats: aliphatic polyurethane enamel, gloss

SYSTEM 7- WOOD, PAINTED.--

1 prime coat: alkyd, exterior wood primer
2 finish coats: acrylic, exterior enamel, semi-gloss

COLOR SCHEDULE.--Colors shall be as shown on the plans.

12-9.07 POWDER COATING

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and applying powder coating finishes to metal surfaces as shown on the plans and these special provisions.

Powdered coatings shall be applied to the following surfaces:

1. Aluminum louvered fence
2. Steel roof access ladder

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and application instructions shall be submitted for approval.

Samples.-- Three samples, 200 mm x 200 mm, with finish color shall be submitted for approval.

QUALITY ASSURANCE.--

Certificates of Compliance.--Certificates of compliance shall be furnished for powder coating materials in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

PART 2.- PRODUCTS

Powder coating.--

Powder coating shall consist of dry polyester powder electrostatically adhered to metal surfaces and baked to form a uniform, durable surface.

Coating color shall be as shown on the plans.

Coating shall conform to the following performance criteria:

Property	Reference
Adhesion	ASTM Designation: D 3359B
Pencil hardness	ASTM Designation: D 3363
Flexibility	ASTM Designation: D 522
Impact resistance	ASTM Designation: D 2794, Modified
Abrasion resistance	ASTM Designation: D 4060, Modified
Salt spray resistance	ASTM Designation: B 117
Humidity resistance	ASTM Designation D 2247

PART 3.- EXECUTION

Application.--All surfaces to be coated shall be cleaned and prepared in accordance with the manufacturer's instructions. Coatings shall be applied in a minimum thickness of not less than 0.08 mm and shall form a smooth, uniform surface.

12-9.08 ACOUSTIC CEILING TILE (Glue On)

GENERAL.--This work consists of furnishing and installing acoustic tile on ceilings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and 2 samples of the acoustic tile shall be submitted for approval.

PRODUCTS.--

Acoustic tile.--

Acoustic tile shall be 305 mm x 305 mm x 15 mm minimum thickness, square edges, nondirectional natural fissured texture, factory applied, washable, off-white vinyl latex finish. Tile shall conform to ASTM Designation: E 1264, Type III, Form 2. Noise Reduction Coefficient (NRC) shall be minimum 0.65. Panels shall have a flame spread rating not exceeding 25.

Adhesives.--

Adhesives shall be as recommended by acoustic tile manufacturer.

EXECUTION.--

PREPARATION.--Surfaces to receive acoustic tile shall be clean, dry and level and shall be prepared in accordance with the adhesive manufacturer's recommendations.

INSTALLATION.--Tile shall be installed in accordance with the manufacturer's recommendations. Installation of tile shall be restricted to periods when the ambient room temperature is between 13°C and 35°C.

12-9.09 ACCOUSTICAL SUSPENDED CEILINGS

GENERAL.--This work shall consist of furnishing and installing suspended ceilings in accordance with the details shown on the plans and these special provisions.

Suspended ceilings shall consist of exposed grid suspension system with lay-in acoustical ceiling panels in areas indicated. Listed fire rated assemblies shall be installed where shown on the plans.

DESIGN.--The suspension system shall be designed to support the weight of ceiling panels, lighting fixtures, air terminals, service assemblies and such other items, not mentioned, which are supported by the suspended ceiling system.

The deflection of any component of the suspension system shall not exceed 1/360 of the span.

The suspension system shall be designed for seismic restraint in accordance with ASTM Designation: E 580.

Lighting fixture attachments shall be designed for a capacity of 100 percent of the lighting fixture weight acting in any direction.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions and complete working drawings of all supporting details, lighting fixture attachments, lateral force bracing, partition bracing and runner and panel layouts shall be submitted for approval.

PRODUCTS.--**Acoustical panels.--**

Acoustical panels shall be factory produced, lay-in panels, 610 mm x 1219 mm x 16 mm thick with non-directional natural fissured random perforated surface texture and factory applied, washable, off-white, vinyl latex finish. Panels shall conform to ASTM E 1264 Type III, form 2. Noise Reduction Coefficient (NRC) shall be minimum 0.65. Panels shall have a flame spread rating not exceeding 25.

Suspension system.--

Suspension system shall be galvanized steel, tee shaped main runners and cross runners and wall molding angles or channels conforming to ASTM Designation: C 635, intermediate duty or heavy duty. Runners shall have exposed flanges approximately one inch wide and positive interlocks between main runners and cross runners. Wall moldings shall have a 19 mm wide exposed face. Runners and moldings shall be bonderized and shall have a flat off-white color, factory painted finish unless otherwise shown on the plans.

Wire hangers.--

Wire hangers shall be 2.7 mm (12-gage) minimum, galvanized, soft-annealed, mild steel wire.

Assembly devices, splices, intersection connectors and expansion devices.--

Assembly devices, splices, intersection connectors and expansion devices shall be as recommended by the suspension system manufacturer.

EXECUTION.--

INSTALLATION.--The suspended ceiling shall be installed square, level and true in accordance with the approved working drawings, the manufacturer's installation instructions and the requirements of ASTM Designations: C 636 and E 580 and Uniform Building Code (UBC) Standard No. 25-2.

Hangers for the suspension system shall be spaced at not more than 1.2 m on centers and shall be saddle tied or wrapped around the main runner members.

Except as specified herein, all lighting fixtures, air terminals, services or other ceiling supported items shall be positively attached to the suspension system.

Lighting fixtures, air terminals, services or other items weighing less than 25 kg shall have, in addition to the requirements specified herein, two 2.7 mm (12-gage) hangers connected from the housing of the fixture, terminal, service or other items to the structure above. These hanger wires may be slack.

Lighting fixtures, air terminals, services or other items weighing more than 25 kg shall be supported directly from the structure above.

The ceiling shall be leveled to within 3 mm in 3.6 m.

MAINTENANCE STOCK.--Upon completion of the suspended ceiling work, one unopened carton of acoustical panels shall be delivered to a location at the project site designated by the Engineer.

12-9.10 GYPSUM BOARD SUSPENDED CEILINGS

GENERAL.--This work shall consist of furnishing and installing suspended ceilings in accordance with the details shown on the plans and these special provisions.

Suspended ceilings shall consist of grid suspension system with attached gypsum panels, lighting and mechanical fixtures. Listed fire rated assemblies shall be installed where shown on the plans.

Related work.—Gypsum board shall conform to requirements of Section 12 "Finishes," under "GYPSUM BOARD SHEATHING."

PERFORMANCE REQUIREMENTS.--The suspension system shall be designed to support the weight of ceiling panels, lighting fixtures, air terminals, service assemblies and such other items, not mentioned, which are supported by the suspended ceiling system.

The deflection of any component of the suspension system shall not exceed 1/360 of the span.

The suspension system shall be designed for seismic restraint in accordance with ASTM Designation: E 580.

Lighting fixture attachments shall be designed for a capacity of 100 percent of the lighting fixture weight acting in any direction.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions and complete working drawings of all supporting details, lighting fixture attachments, lateral force bracing, partition bracing and runner and panel layouts shall be submitted for approval.

PRODUCTS.--

STEEL SUSPENDED CEILING AND SOFFIT FRAMING

General.—Components shall comply with ASTM C 754 for conditions indicated.

Item	ASTM designation	Notes
Wire Hangers	ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 4.12-mm diameter.	
Rod Hangers	ASTM A 510M, mild carbon steel, .34-mm diameter, ASTM A 153/A 153M, hot-dip galvanized	
Flat Hangers	Commercial-steel sheet, ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized Size as indicated	
Angle Hangers	ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized commercial-steel sheet.	
Carrying Channels	Cold-rolled, commercial-steel sheet with a base metal thickness of 1.37 mm, a minimum 12.7-mm wide flange, with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized,	depth as indicated
Cold Rolled Channels	1.37-mm bare steel thickness, with minimum 12.7-mm- wide flange, 19.1 mm deep. wide flange, with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized	depth as indicated
Steel Studs	ASTM C 645.	minimum base metal thickness as indicated
Assembly devices, splices, intersection connectors and expansion devices		as recommended by the suspension system manufacturer
Tie Wire	Tie wire shall conform to ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 1.59-mm diameter wire, or double strand of 1.21-mm diameter wire.	

EXECUTION.--

INSTALLATION.--The suspended ceiling shall be installed square, level and true in accordance with the approved working drawings, the manufacturer's installation instructions and the requirements of ASTM Designations: C 636 and E 580 and Uniform Building Code (UBC) Standard No. 25-2.

Hangers for the suspension system shall be spaced at not more than 1.2 m on centers and shall be saddle tied or wrapped around the main runner members.

Except as specified herein, all lighting fixtures, air terminals, services or other ceiling supported items shall be positively attached to the suspension system.

Lighting fixtures, air terminals, services or other items weighing less than 25 kg shall have, in addition to the requirements specified herein, two 2.7 mm (12-gage) hangers connected from the housing of the fixture, terminal, service or other items to the structure above. These hanger wires may be slack.

Lighting fixtures, air terminals, services or other items weighing more than 25 kg shall be supported directly from the structure above.

The ceiling shall be leveled to within 3 mm in 3.6 m.

12-9.11 THIN FILM FLOORING SYSTEM FOR MAINTENANCE FACILITIES

PART 1. GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing thin film industrial concrete floor coating accordance with the details shown on the plans and these special provisions.

REFERENCES.--

The publications listed below form a part of this specification to the extent referenced. Publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

Various standards as indicated in the specifications.

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

ICRI Technical Guideline 03732 (1997) Selecting and Specifying Surface Preparation for Sealers, Coatings, and Membranes

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SPC-TU 2 (1997) Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment (NACE 6G197)

SUBMITTALS.—

The Contractor shall submit the following in accordance with "Submittal Procedures" in the General Requirements.

Product data.—The Contractor shall submit product data listing test results that confirm sealant, flooring system, primer, and top coat complies with the materials performance requirements of these special provisions. Manufacturer test samples shall have been tested within the last three years. Provide Material Safety Data Sheets (MSDS) for the products to be used at the job site.

Samples.—The Contractor shall provide a color sample of the flooring system to be installed for approval.

Certificates.—The Contractor shall submit certificate of compliance from the manufacturer of the flooring system for approval.

Work Plan.—The Contractor shall submit schedule to complete work within approximately twelve (12) consecutive days. Submit a written plan describing in detail all phases of coating operations. Work sequencing shall be addressed including , surface preparation, flooring system application, re-coat and cure time projections, as well as how each step will be controlled, tested, and evaluated. The Contractor shall address safety measures, work scheduling around weather, and record keeping.

QUALITY ASSURANCE.—

Flooring System Applicator Qualifications.--Minimum requirements for the installation contractor shall indicate three or more jobs within the past two years applying the specified materials to concrete surfaces in which match or exceed the total area designed for this contract. The Contractor shall submit documentation listing location of work, point of contact at job site, total square footage of applied materials, listing of both materials and equipment used, and validation from coating manufacturer documenting quality of materials purchased per job for work match or exceed the design area of this contract. In addition to the above requirements, installation contractor shall be certified by the material manufacturer(s) to install the submitted coatings and sealant. Submit copy of certificates.

WARRANTY.--

The Contractor shall warrant materials and workmanship for a minimum period of one year following coating and sealant application. The following terms and conditions form a part of the warranty: If the applied coating system develops either blisters (chemical), checks, softening, or lifting within one year following application, each area shall be reworked by installation contractor at contractor's expense. The following conditions are excluded from the warranty: A) concrete cracking, flooring system mirrors cracks in concrete; B) cosmetic imperfections due to scratching and gouging; C) application to metallic concrete finishes; and D) application to concrete with a rate of Moisture Vapor Emission (MVE) greater than 197.0 micrograms moisture per second, square meter. If the coating system's adhesion is in question, one adhesion test shall be performed per 9.3 square meters 100 square feet as described in the Article entitled "ADHESION TESTING." To satisfy the warranty, each adhesion test shall produce cohesive failures, concrete removal over 95 percent of each pull-off coupon, and/or adhesion no less than 2.8 MPa. Require two additional adhesion tests to confirm results for each area failing to meet adhesion requirements. Within the warranty period, remove to sound material and rework all areas unable to meet adhesion requirements. There shall be zero percent sealant failures within one year. Within the warranty period, remove and rework all sealant material with chemically attacked surfaces and/or lifting from joint walls. Topcoat cracking over sealant is excluded from warranty.

DELIVERY, STORAGE, AND HANDLING.--

Coatings and sealant shall be stored in spaces with temperatures from 5 degrees C to 24 degrees C. Materials on site shall be inspected for damage prior to use. Return to manufacturer packaged materials in dented, rusty, or leaking containers. Manufacturer shall test returned materials with an expired shelf life and if compliant, reissue a shelf life extension.

COATING HAZARDS.--

The Contractor shall ensure that employees are trained in all aspects of the safety plan. The coating manufacturer's written safety precautions shall be followed throughout mixing, application, and curing of coatings. Comply with respiratory protection requirements in 29 CFR 1910.134 and safe levels of airborne contaminants in 29 CFR 1910.1000.

JOB SITE REFERENCES.--

The Contractor shall make available to the Engineer at least one copy each of ASTM D 4541, ASTM D 6237, SPC-TU 2, and ICRI Technical Guideline 03732, including replica standards ICRI Technical Guideline 03732 CSP 1 through CSP 9, at the job site.

PATCH TEST DEMONSTRATION

General.--Prior to the submitted flooring system's approval, the installation contractor shall apply the complete coating system to a 3 meter by 3 meter square section of concrete as prepared in accordance with Part 3 "EXECUTION." Within this area, perform three adhesion tests as described in the Article entitled "ADHESION TESTING." If adhesion testing produces cohesive failures within the concrete, no less than 1 mm 40 mils concrete removed over 95 percent of each pull-off coupon, and/or adhesion more than 2.75 MPa, patch test adhesion is acceptable. If concrete surface preparation was insufficient, apply an additional coating system patch to properly prepared concrete followed by the above adhesion testing. If adhesion results are unacceptable for both the topcoats and the primer, submit a new coating system manufactured by a different coating vendor. Apply a patch of the new coating system and subject patch to the above requirements for adhesion prior to approval. If the Engineer rejects non-skid grit application, adjustments to the specifications can be made. Grit coarser than #60 aluminum oxide shall not be used.

PART 2.- PRODUCTS

JOINT SEALANT.--

The joint sealant shall be formulated to exhibit the properties as listed in Table IA.

TABLE IA - MATERIALS REQUIREMENTS

Property	Minimum Value	Test Method
Sealant System	Polysulfide (Manganese Cure; MnO ₂) (two-pack: self-leveling) or Urethane	
Percent Volume Solids	100 %	
Chemical Resistance to Motor Oils @ 210 C 48 hours immersion:	2.0% (max) weight increase 5.0% (max) volume increase 2.0% (max) weight loss	ASTM D 1308 (see note 1)
Chemical Resistance to Skydrols 48 hours immersion: @ 210 C	2.0% (max) weight increase 5.0% (max) volume increase 2.0% (max) weight loss	ASTM D 1308 (see note 1)
Hardness	20	ASTM D 2240: Shore A
Tensile Strength (1.0 MPa	ASTM D 412 or ASTM D 638
Percent Elongation	500%	ASTM D 412 or ASTM D 638
Tack Free (12 hours maximum @ 18.30 C	ASTM C 679
Adhesion to Concrete	0.96 MPa	
Adhesion to Urethane Topcoats	0.96 MPa (paintable sealant)	

NOTES:

(1) A 50 mm by 12.5 mm by 12.5 mm section of cured sealant shall be immersed and tested: three samples minimum.

THIN FILM FLOORING SYSTEM

General.—Provide and install a three-coat industrial flooring system consisting of primer and two urethane topcoats. Apply the coating system at a Dry Film Thickness (DFT) ranging from 325 to 500 microns and contain a broadcast of aluminum oxide non-skid grit. The complete flooring system shall be formulated to exhibit the properties as listed in Table IB. Additional requirements for primer coat and urethane topcoat are listed in the following sub-paragraphs.

TABLE 1B--THREE COAT SYSTEM

Property	Minimum Value	Test Method
Tensile Strength	4.83 MPa	ASTM D 2380
Percent Elongation	5.0%	ASTM D 882
Adhesion to Concrete	2.75 MPa or 100 % failure in concrete	ASTM D 4541 (see note 1)
Thermal Compatibility between Concrete	600 C	ASTM C 884
Heat Resistance, continuous exposure	"pass"	
Chemical Resistance to Motor Oils 48 hours immersion: @ 210 C	2.0% (max) weight increase 2.0% (max) volume increase 2.0% (max) weight loss	ASTM D 1308 (see note 2)
Chemical Resistance to Skydrols 48 hours immersion: @ 210 C	2.0% (max) weight increase 2.0% (max) volume increase 2.0% (max) weight loss	ASTM D 1308 (see note 2)
Lead	0.06% (max)	ASTM D 3335
Cadmium	0.06% (max)	ASTM D 3335
Chromium (0.00%	ASTM D 3718

NOTES:

- (1) When tested for adhesion, coating system shall display 2.75 MPa adhesion and/or remove no less than 1.0 mm of concrete over 95 percent of each pull-off coupon throughout service.
- (2) Immediately following immersion, in addition to the listed requirements,

coating system shall be evaluated for blisters, checks, discoloration, softening, and lifting. Coating system shall be visually free of blisters, checks, discoloration, and display both substrate and intercoat adhesion no less than 2.4 MPa (ASTM D 4541).

Primer Coat.--In addition to the requirements of the thin film flooring system, the primer coat shall be formulated to exhibit the properties as listed in Table IC.

TABLE 1C--PRIMER COAT

Property	Minimum Value	Test
Resin System Epoxy (two-pack)		ASTM D 2621
Percent Volume Solids	85%	ASTM D 2697
Color	17925 (white) or 17875 (ultra-light gray)	
Hydrolytic Stability	No effect: 30 days immersion in (see note 1) Sodium Hydroxide solution with pH no less than 13.5	
throughout service	No effect: Insensitive to moisture vapor emission at rates no more than 197.0 micro grams moisture/second, square meter	ASTM F 1869, ASTM D 4541 (see note 2)
Adhesion to Concrete throughout service	2.75 Mpa or 100% failure in concrete	ASTM D 4541 (see note 3)

NOTES:

(1) Immediately following immersion, primer shall be evaluated for blisters, checks, discoloration, softening, and substrate lifting. Primer shall appear free of blisters, checks and moderate discoloration, and display wet adhesion no less than 2.4 MPa (ASTM D 4541).

(2) During and following application, primer shall remain unaffected by Moisture Vapor Emission (MVE) at rates no more than 197.0 micrograms moisture per second, square meter: primer shall meet the requirements of Note (3). Signs of moisture sensitivity include blisters, softening, lifting, and discoloration (whitening).

(3) When tested for in-situ adhesion, primer shall display 2.75 MPa adhesion and/or remove no less than 1.0 mm of concrete over 95 percent off each pull-off coupon.

Urethane Topcoat.--In addition to the requirements of the thin film flooring system, the urethane top coat shall be formulated to exhibit the properties as listed in Table Id.

TABLE 1D—URETHANE TOP COAT

Property	Minimum Value	Test
Resin System	Aliphatic Urethane (two-pack)	ASTM D 2621
Percent Volume Solids	51%	(ASTM D 2697)
Topcoat Color	(FED-STD-595) 17925 (white) or 17875 (ultra-light gray)	
Walkway Stripe Color	22197 (red/orange) semi-gloss (FED-STD-595)	
Application Thickness per Coat	62.5 microns to 80 microns Dry Film Thickness(DFT)	
Hiding Power: Red/Orange	Complete hiding of white coatings at 80 microns DFT(one coat)	
Sunlight Resistance	Non-yellowing	
Heat Resistance continuous exposure	600 C	
Heat Resistance, intermittent exposure	93.30 C	
Chemical Resistance to Motor Oils 48 hour immersion: @ 210 C	1.0% (max) weight increase 1.0% (max) volume increase 1.0% (max) weight loss	ASTM D 1308 (see note 1)
Chemical Resistance to Skydrols 48 hours immersion: @ 210 C	1.0% (max) weight increase 1.0% (max) volume increase 1.0% (max) weight loss	(ASTM D 1308)(see note 1)

NOTES:

(1) Immediately following immersion, in addition to the listed requirements, urethane topcoat shall be evaluated for blisters, checks, discoloration, softening, and lifting. Urethane topcoat shall be visually free of blisters, checks, and discoloration, and display adhesion no less than 2.4 MPa (ASTM D 4541).

WHITE ALUMINUM OXIDE NON-SKID GRIT.--

Non-skid grit shall be size #60, dust free (washed and dry), minimum 99 percent pure, having the following sieve analysis when tested using a 1000 gram 2.2 pound sample (ASTM E 11):

Sieve No. 40 100% passing
Sieve No. 50 15-30% retained
Sieve No. 60 70-85% retained
Sieve No. 70 0-15% retained

PREAPPROVED MATERIALS.--

Acceptable manufacturers shall be the following or approved equal:

Polyspec (281) 397-0033	Primer: Topcoat: Sealant:	300EX Tuffrez 235 T-2235SL
Tennant (800) 553-8033	Primer: Topcoat: Sealant:	Eco-MPE (see note 1) VOC-CRU N/A (see note 2)
General Polymers (800) 543-7694	Primer: Topcoat: Sealant:	#3578, Universal Primer #4618, Polyurethane Enamel Cor-Seal PS
DEX-O-TEX (310) 886-9100	Primer: Topcoat: Sealant:	Aero-Flor System components per manufacturer's recommendation

NOTES:

It is the Contractor's responsibility to confirm pre-approved material formulations have not changed and specification requirements will be met.

- (1) ECO-CRE primer is to be used on floors with heavy Skydrol use.
- (2) Polyspec T-2235SL sealant may be used.

PART 3.- EXECUTION

COATING SAMPLE COLLECTION

General.--The Engineer and coating contractor shall witness all material sampling. Notify the Engineer a minimum of three days in advance of sampling. Obtain liquid samples of each component of primer and topcoat by random selection from sealed containers and in accordance with ASTM D 3925. Samples may be either individual cans of liquid material or 1.0 liter 1.0 quart quantities of properly mixed, extracted, and sealed liquid material. Identify samples by designated name, specification number, batch number, project contract number, sample date, intended use, and quantity involved. When the applied coating system has met the requirements defined in the Article entitled "ADHESION TESTING," coating samples shall be returned to the installation contractor for proper disposal.

DEGREASING.—

General.--On both coated and uncoated concrete, the Contractor shall degrease entire floor by scrubbing using a solution of hot potable water, 49 degrees C to 77 degrees C , and a concentrated water-based alkaline degreaser. Perform two complete degreasing cycles on the entire floor surface. Allow solution to soak into surfaces prior to scrubbing and remove using hot potable water under a minimum of 27.6 MPa . Rinsing shall be complete when the rinse water appears clear. If the industrial detergent is not biodegradable, collect all rinse water and dispose as hazardous waste. Squeegees and shop vacuums may be used to collect pooling rinse water. Fans may be used to aid drying of floor surfaces.

SURFACE PREPARATION.—

General.--Shot blast entire floor to produce a level of coarseness equal to ICRI Technical Guideline 03732 CSP 3. Overlap each pass of shot blasting by 6.25 mm to 12.5 mm . Add new shot to shot blasting equipment prior to blasting. Prepare surfaces inaccessible to shot blasting, base of perimeter walls and under secured equipment, using diamond disk grinding and/or light scarification to produce a level of coarseness equal to ICRI Technical Guideline 03732 CSP 2 and/or ICRI Technical Guideline 03732 CSP 4, respectively. Resulting surfaces shall appear clean and contain the appropriate level of surface coarseness. If the resulting level of cleanliness cannot be determined, place numerous drops of water on surfaces that appear contaminated. If the water drops soak into concrete, the surfaces are free of hydrocarbon contamination (oils, grease, skydrol). If the water drops bead up and do not flatten out, surfaces require additional degreasing as detailed in the Article entitled "DEGREASING." Shot blasting coarse concrete and/or broom finished concrete can produce a level of coarseness equal to ICRI Technical Guideline 03732 CSP 5: employ a best effort attempt to minimize over shot blasting of coarse concrete. If coarse concrete is encountered, shot blasting to a level of coarseness equal to ICRI Technical Guideline 03732 CSP 5 is acceptable: however, extremely coarse concrete can require resurfacing prior to the flooring system's installation. Sweep, vacuum, and run a high powered magnet over all surfaces to be coated, including joints.

JOINT TREATMENT.--

The Contractor shall use the "Conventional Sealed Joint" as detailed in Figure 1 of SPC-TU 2 to seal joints. Employ measures to reduce contamination from equipment and foot traffic. Limit floor access to essential contractor personnel. Confirm joint surfaces are sufficiently clean.

Install Backer Rod.--A continuous length of round, closed-cell polyethylene backer rod shall be installed into each joint using a backer rod tool. For 12.5 mm , 9.4 mm , and 6.25 mm wide joints, place backer rod to a depth of 9.4 mm (depth equals the distance from the concrete's surface to the highest point on the backer rod). For joints greater than or equal to 18.75 mm width, place backer to a depth of 15.6 mm inch below the concrete's surface. Fit backer rod tight between joint walls (30 percent compression). All backer rod that is installed using either the incorrect size (loose fit) or at the incorrect depth shall be removed and reinstalled. Following backer rod installation, painter's tape shall be applied to surfaces adjacent joints to protect from sealant.

Sealant Application.--Sealant shall be applied directly into joints using a bulk-calking gun. At room temperature, the resulting sealant application shall exhibit a concave recess between 3.2 mm to 1.6 mm below the concrete's surface. Remove and reapply cured sealant remaining either flush or greater. Following sealant application, painter's tape and sealant drips on concrete surfaces shall be removed. Sealant shall be cured a minimum of 24 hours, prior to the application of coatings.

COATING APPLICATION.—

General.--Flooring space shall be vacuumed one additional time prior to coating application. Primer shall be applied to flooring space at 175 microns to 375 microns Dry Film Thickness (DFT). If the prepared concrete resembles an ICRI Technical Guideline 03732 CSP 3 surface, the primer shall be applied at a minimum of 175 microns DFT. If the prepared concrete resembles an ICRI Technical Guideline 03732 CSP 5 surface, the primer shall be applied at a maximum of 375 microns DFT. The previously applied sealant may be lightly coated.

Non-Skid Grit Broadcast.--Non-skid grit shall be broadcast at a rate of 680 grams per 9.3 square meters into the second urethane top coat and backroll. The floor shall be mapped into 55.8 square meter sections where 4080 grams of non-skid grit is pre-weighed, placed into clean buckets and used in its entirety per marked 55.8 square meter section.

Application of Topcoats.--Two coats of urethane topcoat shall be applied to the epoxy primer and broadcast white aluminum oxide non-skid grit directly into the second urethane topcoat.

First Topcoat.--A full coat of the urethane topcoat shall be applied at a spreading rate from 62.5 to 80 microns Dry Film Thickness (DFT). Floor edges and around equipment footings shall be stripe coated. Monitor and record a minimum of one Wet Film Thickness (WFT) reading per 55.8 square meter of floor surface. Sealant shall be lightly coated.

Second Topcoat.--A second coat of the urethane topcoat shall be applied at a spreading rate of 62.5 to 80 microns 2.5 to DFT. Floor edges and around equipment footings shall be stripe coated. Monitor and record a minimum of one WFT reading per 55.8 square meters of floor surface prior to broadcasting non-skid grit. When the correct WFT has been achieved, immediately and evenly broadcast non-skid grit directly into the second topcoat of urethane and backroll in two directions.

Walkway Stripe Markings.--Walkway stripe markings shall be placed according to the drawings, if applicable. When the second topcoat is within its recoat window, apply a walkway stripe of the red/orange urethane topcoat at 75 microns DFT, completely hiding the top coat, in one coat. If insufficient hiding occurs, apply one additional coat of the walkway stripe. on-skid grit shall be lightly broadcast into the wet walkway stripe. Solvent resistant tape shall be used to protect the floor coating against stripe coat bleed. A thin clear coat of either epoxy or urethane may be required to prevent stripe coat bleed prior to the full application of the colored stripe coat.

CURING.--

Installed materials shall be cured to display performance equal to manufacturer's product literature. The Contractor shall remove and reapply improperly cured material.

FIELD TESTS AND INSPECTION.—

Coating Inspector.--The coating system shall be inspected by a manufacturer's representative. The Coating Inspector shall be present during all field tests, surface preparation, flooring application, initial cure of the flooring system, and during all flooring repair work. The Coating Inspector shall provide all tools/equipment necessary to perform field tests and inspection. The Coating Inspector shall be responsible for field tests and specified level of inspection.

Inspection.--The Coating Inspector shall document weather conditions, job site occurrences, and report conditions and occurrences potentially detrimental to the flooring system.. The Coating Inspector shall prepare a project reference sheet outlining all requirements, tests, test methods, and evaluation criteria, and hold regular meetings with contractor personnel, including shot blasting operators and applicators, to review requirements/evaluation criteria for upcoming work prior to execution. At the start of coating operations and every 1.0 hour following until daily work is complete, record air temperature, substrate temperature, and relative humidity. Inspection shall follow the application of each coat, and identify surfaces for improperly cured material, blisters, inadequate and/or excessive coating thickness, and other defects. Document

each inspection, test, non-compliant area, and location of each non-compliant area. List method of evaluation, evaluation criteria, areas requiring rework, and all other pertinent observations.

Adhesion Testing.—The Contractor shall perform a minimum of three adhesion tests in accordance with ASTM D 4541 to the thin film flooring system. Three random flooring locations shall be selected spaced a minimum of 6 meters between each location. Prior to attaching pull-off coupons, the flooring surface shall be lightly sanded and pull-off coupons attached containing a grit-blasted anchor profile. Adhere directly to the center of each sanded surface a 18.75 mm diameter pull-off coupon. When pull-off coupon adhesive has sufficiently cured, score circumference of each pull-off coupon to concrete substrate. Test adhesion and evaluate results. If testing produces cohesive failures within the concrete, no less than 1 mm concrete removed over 95 percent of each pull-off coupon, and/or adhesion more than 2.75 MPa coating system's adhesion is acceptable. If the above requirements are not satisfied, then perform one adhesion test per 9.3 square meters using the above procedures. Perform two additional tests per non-compliant area to confirm results. Remove to sound material and rework all areas unable to meet adhesion requirements. Repair each adhesion test using a combination of primer, sand-filled epoxy mortar (for deep cohesive failures, if applicable), and two urethane topcoats. Make repairs flush with adjacent coatings and display an equivalent appearance.

FINAL CLEANUP.--

Following completion of the work, the Contractor shall remove debris, equipment, and materials from the site. Remove temporary connections to State or Contractor furnished water and electrical services. Existing facilities shall be restored in and around the work areas to their original condition.

SECTION 12-10. SPECIALTIES

12-10.01 TACKBOARDS

GENERAL.--This work shall consist of furnishing and installing tackboards in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, color and texture samples and installation instructions shall be submitted for approval. Color and texture will be selected by the Engineer after the award of the contract.

PRODUCTS.--

Tackboards.--

Tackboards shall be textured plastic coating on cotton-fabric, pressure laminated to 6 mm thick cork underlayment. Cork underlayment shall be bonded to a 6 mm thick hardboard backing. Tackboard dimensions shall be as shown on the plans.

Border moldings.--

Border moldings shall be factory applied, extruded clear anodized aluminum trim.

EXECUTION.--

INSTALLATION.--Tackboards shall be installed rigidly, securely, plumb and true, and in accordance with the manufacturer's recommendations.

12-10.02 MARKER BOARDS

GENERAL.--This work shall consist of furnishing and installing a marker boards in accordance with the details shown on the plans and these special provisions.

One felt eraser and 12 felt tipped liquid chalk markers of assorted colors shall be furnished for each marker board installed.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Marker board.--

Marker board shall conform to Porcelain Enamel Institute Standard PEI-S-104, and shall be porcelain enamel surface on 0.61 mm thick (24-gage) sheet steel pressure laminated to 6 mm thick tempered hardboard. Hardboard shall have a backing of 0.38 mm nominal thickness aluminum sheet. Enamel surface shall be suitable for marking with felt tipped liquid chalk markers and erasing with a felt eraser or dry cloth. The enamel surface shall be white in color.

Marker board dimensions shall be as shown on the plans.

Trim and marker tray.--

Trim and marker tray shall be factory installed, satin finish, clear anodized aluminum extrusions.

EXECUTION.--

INSTALLATION.--Marker boards shall be installed rigidly, securely, plumb and true in accordance with the manufacturer's instructions.

12-10.03 SOLID PLASTIC TOILET PARTITIONS

GENERAL.--This work shall consist of furnishing and installing solid plastic toilet partitions in accordance with the details shown on the plans and these special provisions.

Solid plastic toilet partitions shall consist of panels, doors, pilasters, headrails, urinal screens, fasteners, anchorages and hardware. Internal reinforcement shall be provided at all fasteners, anchorages, hardware and accessories.

SUBMITTALS.--Manufacturer's descriptive data, standard color palette, installation instructions and working drawings shall be submitted for approval.

Colors will be selected from the manufacturer's standard color palette by the Engineer after the award of the contract.

Working drawings shall show the plan layout, door and panel elevations and all details required for the complete installation and anchorage of the partition system.

PRODUCTS.--

Doors and panels.--

Doors and panels shall be flush, 25 mm minimum thickness, high density polyethylene.

Doors shall have controlled action hinges, with vertical pintle and ball bearing roller operating on adjustable cams, or moving parts of nylon and stainless steel. Top pivots shall be recessed into edges of doors.

Doors shall be provided with slide bar latch with lever type actuator and a combination coat-hat hook and door stop. Doors on stalls designed for use by the disabled shall also be provided with door pulls.

Pilasters.--

Pilasters shall be 25 mm thick, of the same construction as the doors and panels, and shall have an adjustable, leveling base.

Headrails.--

Headrails shall be anodized aluminum, 25 mm x 38 mm minimum, with exposed ends capped.

Urinal screens.--

Urinal screens shall be wedge type, wall-mounted, and of the same construction as the doors and panels. All fasteners shall be concealed.

Fasteners and anchorages.--

Fasteners and anchorages shall be stainless steel with vandal resistant heads.

Hardware.--

Hardware shall be highly polished chromium plated, cast alloy, or heavy duty anodized aluminum.

Pilasters anchors.--

Pilasters anchors shall be integral stud anchor type or internally threaded expansion sleeve type with single cone expander. Self-drilling type anchorage shall not be used.

Pilaster shoes.--

Pilaster shoes shall be one-piece, stainless steel, with concealed hold down clips, and of sufficient height to completely cover the base and anchors.

EXECUTION.--

INSTALLATION.--Solid plastic toilet partitions shall be installed rigidly, securely, plumb, and true and in accordance with the manufacturer's recommendations. Tops and bottoms of doors shall align with tops and bottoms of panels, and all horizontal lines shall be level.

Rigid backing shall be provided in walls to receive anchorages.

Panels shall be anchored with at least 3 brackets at each wall and pilaster. Two anchors shall be used to fasten each pilaster base to the floor.

Doors shall not bind during opening and closing. The clearance between the door edges and pilasters shall be uniform, equidistant, and shall not exceed 5 mm. Hinges shall be adjusted to hold doors ajar when unlatched. Doors on stalls designed for use by the disabled shall return to the closed position.

Drilling, cutting and fitting of wall and floor finishes shall be concealed by the completed installation.

CLEAN-UP.--Toilet partitions shall be cleaned, polished and free of all defects. Chipped, dented, scratched, or otherwise damaged work shall be replaced at the Contractor's expense.

12-10.04 OPERABLE PARTITIONS**PART 1.- GENERAL****SUMMARY.--**

Scope.—This work shall consist of providing and installing factory fabricated operable partitions complete with all necessary hardware for a complete installation in accordance with the plans and these special provisions.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 84 (1999) Surface Burning Characteristics of Building Materials

ASTM E 90 (1999) Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions

ASTM E 413 (1987; R 1999) Rating Sound Insulation

SYSTEM DESCRIPTION.—

General.--Operable partition system shall be flat wall, manual operation acoustical operable partitions as shown on the drawings including all hardware, seals, track and rollers as needed to close the specified opening. The partition shall be made up of a series of rigid, flat wall panels; each panel being a one-piece assembly nominally 1.2 m wide. Unless otherwise specified, the wall shall comprise the least number of panels. The mechanical seal of the panel shall actuate with a single operating action.

Manual Operation.--The manual operation shall be accomplished with less than 89 N force to start movement at the rate of 1.02 m/s . A removable handle shall be used to extend and retract the bottom operable seals; vertical movement of seals shall be 50 mm. Closure to the lead wall shall be by use of a flexible bulb; final closing shall be accomplished by means of a lever exerting pressure against wall.

SUBMITTALS.--

The Contractor shall submit the following in accordance with "Submittal Procedures" in the General Requirements.

Working Drawings.--Drawings containing complete schematic diagrams and details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

Product Data.--Manufacturer's descriptive data, performance charts, catalog cuts, and installation instructions.

Samples.--Color samples of specified surfaces and finishes to match those specified. Finish and color requirements shall not be limited to manufacturer's standard selections in order to meet these requirements.

Certificates.--Certificate attesting that the materials meet the requirements specified and that partitions have specified acoustical and flame retardant properties, as determined

Operation and Maintenance Data.--Six complete copies of operating instructions outlining the procedures required for electrically operated partitions. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and operating features. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Six complete copies of maintenance instructions explaining routine maintenance procedures including inspection, adjustments, lubrication, and cleaning. The instructions shall list possible breakdown, methods of repair, and a troubleshooting guide. The instructions shall include equipment layout and simplified wiring and control diagrams of the system as installed.

DELIVERY AND STORAGE.--

Materials shall be delivered to the job site in the manufacturer's original, unopened packages and shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

WARRANTY.--

The Contractor shall provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2.- PRODUCTS

MATERIALS.—

General.--Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 year prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Engineer, reasonably convenient to the site. Door and partition finishes shall have a Class A rating when tested in accordance with ASTM E 84.

Panel Surface Finish.--Panel surface finish shall be a vertically-ribbed acoustical synthetic fabric material of 100 percent polyolefin. Pile height shall be minimum 2.5 mm thickness. Color shall match that listed in the drawing Interior Finish Materials Legend.

Hardware.--Operable partitions shall have manufacturer's standard hardware. Hardware shall be anodized aluminum with a natural finish, chrome plated or brass plated metal, or painted finish.

Sweep Strips.--Sweep strips shall be vinyl or other material which will not crack or craze with severe usage. Sweep strip shall control STC to the specified rating.

Track.--Track shall be recessed as shown and shall be of extruded aluminum or enamel finish steel. Track shall be manufacturer's standard product designed for the weight of the finished partition, including door. Track sections shall be provided in the maximum lengths practicable, not less than 1.8 m long except for narrow doors and at ends of runs where short length is required. Suitable joint devices such as interlocking keys shall be provided at each joint to provide permanent alignment of track.

Metal Soffit.--Soffit shall be provided when steel track is recessed. Soffit shall be of metal of adequate thickness to protect the ceiling from damage by door operation and shall be provided with the door manufacturer's standard neutral-color applied finish. Soffit on aluminum track shall be an integral part of the track.

Vinyl Restrictions.--Vinyls shall contain a non-mercury based mildewcide and shall be manufactured without the use of cadmium-based stabilizers.

OPERABLE PARTITIONS

General.--Operable partitions shall consist of top hung ball bearing carriers which support paired modular panels. Partition finish shall have a flame spread rating of not more than 25 in accordance with ASTM E 84.

Panels.--Panels shall be constructed of minimum 1.9 mm thick steel frames with minimum 0.80 mm thick face panels spot welded to the frame. Panels shall be not more than 1.2 m , except for end closure panels, and shall be full height to track. Panels shall lock in place to form a stable, rigid partition; low profile hinges shall project 6 mm maximum from panel edge. Panels shall be surfaced with wall carpet which wraps around the vertical panel edges without vertical trim. Panel thickness (100 mm nominal) and composition shall be designed to provide an STC rating of not less than 50 in accordance with ASTM E 90 and ASTM E 413.

Seals.--Bottom seals shall consist of a vinyl sweep mechanical seal which will expand in place or shall be accomplished by using panels which can be lowered by a removable operating device. Vertical seal between panels shall be anodized, architectural grade, aluminum extrusion with vinyl sound seal.

COLOR.--

Color shall be in accordance with Interior Finish Legend included in the drawings.

PART 3.- EXECUTION

INSTALLATION.--

Installation shall be in accordance with the manufacturer's approved installation instructions.

12-10.05 LOUVERS

GENERAL.--This work consists of furnishing and installing louvers in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.—

Louvers.--

Louvers shall be factory fabricated units of extruded aluminum alloy not less than 2 mm thick (12-gage) or galvanized steel sheet not less than 1.63 mm thick (16-gage) with standard "Z" type blades, and removable bronze 16 x 16 mesh insect screens mounted on the inside of the units.

Gravity units shall have blades center pivoted on a 10 mm diameter aluminum rod set in stainless steel ball bearings with cadmium plated races. Blades of gravity louvers shall be equipped with vinyl bulb seals on the edges.

Louvers shall have integral caulking strips and retaining beads.

The finish on louvers shall be baked on primer and fluorocarbon polymeric resin.

EXECUTION.--

INSTALLATION.--Louvers shall be installed in accordance with the manufacturer's instructions. The completed louver installation shall be weather tight.

12-10.06 FLAGPOLE

GENERAL.--This work shall consist of designing, furnishing, and installing a groundset flagpole and foundation in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Flagpole.--

Flagpole shall be tapered, 10.7 meter exposed height, 6063-T6 aluminum alloy pole with 150 mm diameter aluminum ball, ball bearing non-fouling truck with aluminum body and 102 mm diameter aluminum sleeves, 230 mm cast aluminum cleat and 8 mm polypropylene rope halyards with flag clasps. Aluminum shall be clear anodized after fabrication.

Metal sleeve, sand, wedges and sealant for flagpole foundation.--

Metal sleeve, sand, wedges and sealant for flagpole foundation shall be as recommended by the flagpole manufacturer. Metal sleeve shall be capped and shall have a ground spike with support plate.

Concrete.--

Concrete shall be as specified "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions and shall contain not less than 350 kg of cement per cubic meter.

EXECUTION.--The flagpole shall be erected plumb and rigid in accordance with the manufacturer's recommendations. Sand shall be consolidated before placing sealant.

12-10.07 METAL SIGNS

GENERAL.--This work shall consist of furnishing and installing metal emergency pump shutoff signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, colors, graphics and fastening details shall be submitted for approval.

PRODUCTS.--

Signs.--

Signs shall be sheet steel, not less than 1.22 mm thick (18-gage) with a baked-on enamel coating.

Signs shall have a white background with contrasting red letters. Red letters shall be 50 mm minimum in height.

Fasteners.--

Fasteners shall be as recommended by the sign manufacturer.

EXECUTION.--Sign inscriptions shall read as shown on the plans.

Each sign shall be located as shown on the plans and shall be fastened in place with a minimum of 6 fasteners for each sign.

12-10.08 PLASTIC SIGNS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing signs in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for sign materials, colors and graphics, and for fastening hardware and material shall be submitted for approval.

PART 2.- PRODUCTS

Plastic signs (permanent room identification).--

Plastic signs for permanent room identification for other than restrooms shall be scratch resistant, non-static, fire retardent, washable melamine laminate with a non-glare surface, not less than 3 mm thick. Letters and numbers shall be upper case Helvetica, 25 mm in height, 0.80 mm above and integral with sign material, accompanied by Grade 2 Braille.

Grade 2 Braille dots shall be 2.5 mm on centers in each cell with 5 mm space between cells. Dots shall be raised a minimum of 0.6 mm above the background.

Plastic sign (restroom).--

Plastic sign for restroom shall be not less than 6 mm acrylic plastic. Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Male/female symbol and lettering shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Male restroom identification shall be a male symbol on an equilateral triangle with edges 305 mm long and a vertex pointing upward.

Female restroom identification shall be a female symbol on a 305 mm diameter circle.

Unisex restroom identification shall be a male and female symbol on a 305 mm equilateral triangle superimposed on a 305 mm diameter circle.

Accessible building entrance sign.--

Accessible building entrance sign shall be not less than 3 mm acrylic plastic, not less than 102 mm x 102 mm , with the international symbol of accessibility.

Accessible building entrance sign shall be pressure sensitive decal, not less than 102 mm x 102 mm with the international symbol of accessibility.

Sign background shall be blue and shall conform to Federal Standard 595B, Color No. 15090. Symbol and border shall be white and shall conform to Federal Standard 595B, Color No. 17886.

Self-luminous sign (exit).--

Self-luminous sign shall be internally illuminated, self-luminous exit sign powered by permanent integral tritium gas source. Sign shall be listed by the California State Fire Marshal, and UL or other approved testing laboratory.

Sign housing shall be ABS molding. Faceplate shall be acrylic.

Fastening hardware and material.--

Fastening hardware and material shall be as recommended by the sign manufacturer. Fasteners shall be noncorrosive.

PART 3.- EXECUTION

Inscription.--Except for loft and exit signs, sign messages shall be as shown on the plans.

Installation.--Plastic signs for room identification and restrooms shall be fastened or secured to clean, finished surfaces in accordance with the sign manufacturer's instructions. Signs shall be installed at a location and height as shown on the plans.

Metal signs shall be attached securely with galvanized or cadmium plated fasteners.

Fastening hardware and material shall be installed within the sign as shown on the plans.

12-10.09 WARDROBE LOCKERS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing wardrobe lockers in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, installation instructions, and standard color palette shall be submitted for approval.

Unless otherwise shown on the plans, the color will be selected by the Engineer from the standard color palette after the award of the contract.

PART 2.- PRODUCTS

ACCEPTABLE MANUFACTURERS.--

Available manufacturers.--Subject to conformance with the contract provisions, metal lockers shall be Art Metal Products; Lyon Metal Products; Republic Storage Systems; or equal.

Lockers.--

Lockers shall be standard, factory fabricated steel units. Framing shall be 1.52 mm thick (16-gage) and face sheets shall be 0.61 mm (24-gage), except door face sheets shall be 1.5 mm (16-gage).

Lockers shall be equipped with the following: hat shelf located approximately 255 mm below the top of the wardrobe locker, side to side coat rod, coat hook, louver vents at top and bottom of door, nonbreakable grip and turn handle, provisions for a padlock, lockbar with 3-point latching contact with door frame and 1 1/2 pair full looped leaf hinges.

The approximate dimensions of the wardrobe lockers shall be 380 mm wide, 457 mm deep and 1829 mm high.

Closed base.--

Closed base shall be the manufacturer's standard continuous 152 mm base, fabricated of the same material and designed for use with the lockers provided. Bottoms shall be flanged inward for stiffening. Bases shall have the same finish as the locker units.

Top.--

Top shall be the manufacturer's standard continuous sloping top with end closure as needed, fabricated of the same material and designed for use with the lockers provided. Tops shall have the same finish as the locker units.

FABRICATION.--

Shop assembly.--Lockers shall be fabricated square, rigid, and without warp, with metal faces flat and free of dents or distortion.

Frame joints and seams shall be welded. Exposed welds shall be ground smooth. Hinge and latch connections shall be welded or riveted.

Bolts shall be used for assembly and mounting lockers components. Bolt or rivet heads on fronts of locker doors or frame shall not be exposed.

Factory finish.--Lockers shall be chemically pretreated with degreasing and phosphatizing process. Wardrobe lockers shall have a baked enamel finish on all surfaces, exposed and concealed.

PART 3.- EXECUTION

Installation.--Lockers shall be mounted on closed bases at locations shown in accordance with the manufacturer's instructions for plumb, level, rigid, and flush installation.

Wardrobe lockers shall be bolted together at tops and bottoms. The backs of the end lockers shall be bolted to wall anchors with 6 mm bolts installed near the tops of the wardrobe lockers as recommended by the locker manufacturer.

Trim, sloping tops, and metal filler panels, if required, shall be installed using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

The number of lockers shall be as shown on the plans.

12-10.10 WOOD BENCHES

GENERAL.--This work shall consist of furnishing and installing wood benches in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

PRODUCTS.--

Acceptable manufacturer's.--Subject to compliance with these requirements, manufacturer's shall be Penco Products, Inc.; Republic Storage Systems, Inc.; Interior Steel Equipment Co.; or equal.

Seat.--

Seat shall be factory fabricated, laminated seat units of solid birch or other suitable, dense hardwood and manufacturer's standard clear coating. Seat units shall be approximately 240 mm wide by 32 mm thick, in lengths as shown on the plans. Edges of the seat shall be rounded and all surfaces shall be smooth and free of splinters which would snag clothing or skin.

Supports assemblies.--

Supports assemblies shall be standard steel pedestal assemblies with continuously welded top and bottom flange fittings. Flanges shall have provisions for fasteners to the floor and securing to the bench. Pedestal diameter shall be not less than 32 mm. Pedestal color and finish shall be selected from the manufacturer's standard colors.

Fasteners.--

Fasteners for fastening seat units and support assemblies shall be the manufacturer's standard fasteners for the purpose intended.

PART 3.- EXECUTION

Installation.--Bottom flange fittings of the support assemblies shall bear solidly on the floor without rocking and shall be fastened rigidly and securely to the floor in accordance with the manufacturer's recommendations.

12-10.11 FIRE EXTINGUISHERS AND CABINETS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing fire extinguishers with cabinets or mounting brackets in accordance with the details shown on the plans and these special provisions.

REFERENCES.--

General.--Fire Extinguishers shall conform to the requirements in California Code of Regulations, Title 19 Division 1, Chapter 3, "Portable Fire Extinguishers."

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

QUALITY ASSURANCE.--

Codes and standards.--Fire extinguishers shall be Underwriters Laboratories or Factory Mutual Laboratories approved for the type, rating and classification of extinguisher specified.

PART 2.- PRODUCTS

MANUFACTURER'S.--

Acceptable manufacturers.--Subject to contract compliance, manufacturers shall be J. L. Industries; Larsen's Manufacturing; Potter-Roemer; or equal.

COMPONENTS.--

Fire extinguisher.--

Fire extinguisher shall be fully charged, multi-purpose dry chemical type, with charge indicator, hose and nozzle, and attached service record tag. Fire extinguisher shall be of the capacity and type rating shown on the plans.

Mounting bracket.--

Mounting bracket shall be the manufacturer's standard painted, surface mounted type.

Fire extinguisher cabinet.--

Fire extinguisher cabinet shall be factory fabricated, constructed of steel with a clear plastic panel in a steel door frame, and shall have a baked enamel finish. Color to be selected by the Engineer from the manufacturer's standard colors.

Fire extinguisher cabinet shall be semi-recessed as shown on the plans.

PART 3.- EXECUTION

INSTALLATION.--

General.--Fire extinguishers shall be installed in locations and at mounting heights shown on the plans, or if not shown, at a height of 1220 mm from the finished floor to the top of the fire extinguisher.

Fire extinguisher mounting brackets and cabinets shall be attached to structure, square and plumb, in accordance with the manufacturer's recommendations.

IDENTIFICATION.--

Cabinet-mounted.--Extinguishers in cabinets shall be identified with letter spelling "FIRE EXTINGUISHER" applied to the cabinet door. Letter size, styles, and color shall be selected by the Engineer from manufacturer's standard arrangements.

SERVICING.--

General.--Fire extinguishers shall be serviced, charged, and tagged not more than 5 days prior to contract acceptance.

12-10.12 FREE STANDING STEEL SHELVING

GENERAL.--This work shall consist of furnishing and installing free standing steel shelving in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive data, installation instructions and standard color palette shall be submitted for approval. The color will be selected by the Engineer after the award of the contract.

PRODUCTS.--

Shelving.--

Shelving shall be factory fabricated steel shelves and supports capable of supporting loads of 1200 Pa of shelf area. Shelves shall not deflect more than 8 mm when subjected to the loads specified herein and shall show no permanent deflection after removal of such loads. Shelves shall be supported and attached by means of clips. Studs or bolts shall not be used. Shelves shall be adjustable in vertical increments of 75 mm or less. Shelving shall be of the approximate dimensions and number shown on the plans and shall have a baked enamel finish.

EXECUTION.--Free standing steel shelving shall be installed in accordance with the manufacturer's instructions.

12-10.13 TOILET AND SHOWER ACCESSORIES

PART 1.- GENERAL

Scope.--This work shall consist of furnishing and installing toilet and shower accessories in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and installation instructions and details shall be submitted for approval.

PART 2.- PRODUCTS

Toilet tissue dispenser.--

Toilet tissue dispenser shall be dual roll, surface mounted, stainless steel with satin finish, approximately 150 mm x 290 mm x 150 mm deep. Dispenser shall utilize standard toilet tissue rolls. The top roll shall automatically drop into place after the bottom roll is depleted. One dispenser per toilet stall.

Combination paper towel dispenser and waste receptacle.--

Combination paper towel dispenser and waste receptacle shall be semi-recessed unit of stainless steel with satin finish. The approximate size shall be 355 mm x 1880 mm x 190 mm deep with 102 mm skirt. The paper towel dispenser shall have a capacity of 1000 single fold paper towels. The waste receptacle shall have a capacity of not less than 37 liters. One unit per lavatory.

Toilet seat cover dispenser.--

Toilet seat cover dispenser shall be white plastic dispenser, approximately 210 mm x 320 mm x 48 mm deep, single pack. One dispenser per toilet stall.

Napkin receptacle.--

Napkin receptacle shall be wall hung, white enameled sheet steel napkin receptacle with hinged top and bottom, disposable liner, approximate 3.8 liter capacity container. One receptacle per women's toilet stall.

Waste receptacle.--

Waste receptacle shall be white enameled sheet steel waste receptacle, 45 liter minimum capacity. One receptacle per toilet room.

Clothes hook.--

Clothes hook shall be stainless steel clothes hook with 2 prongs.

Paper towel dispenser.--

Paper towel dispenser shall be white enameled sheet steel towel dispenser with a capacity of 1000 single fold paper towels. One dispenser per lavatory.

Liquid soap dispenser.--

Liquid soap dispenser shall be surface mounted, heavy duty plastic dispenser for industrial use with a capacity of at least 710 mL. One dispenser per lavatory.

Powdered soap dispenser.--

Powdered soap dispenser shall be surface mounted, white enameled sheet steel dispenser with a capacity of at least 887 mL. The dispenser shall have an adjustable soap dispensing mechanism and a lockable top. One dispenser per lavatory.

Mirror, wall hung.--

Mirror, wall hung shall be Number 1 quality, 6 mm thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror shall have a heavy gage galvanized steel back and stainless steel frame. The frame shall have a satin finish and shall be mitered and welded and the corners shall be ground smooth. Fasteners shall not penetrate surfaces of the frame exposed to view. Mirror shall conform to Federal Specification: DD-M-411b and shall be guaranteed against silver spoilage for not less than 10 years.

Mirror, wall hung with shelf.--

Mirror, wall hung shall be Number 1 quality, 6 mm thick, electrolytically copper plated float or plate glass mirror with nonmoisture-absorbing filler. Mirror shall have a heavy gage galvanized steel back and stainless steel frame with integral 127 mm wide stainless steel shelf. The frame shall have a satin finish and shall be mitered and welded and the corners shall be ground smooth. Fasteners shall not penetrate surfaces of the frame exposed to view. Mirror shall conform to Federal Specification: DD-M-411b and shall be guaranteed against silver spoilage for not less than 10 years.

Steel grab bars.--

Steel grab bars shall be stainless steel, 38 mm diameter bars and escutcheon covered integral mounting flanges.

Combination soap dispenser-utility shelf.--

Combination soap dispenser-utility shelf shall be stainless steel with satin finish. Liquid soap dispenser with a capacity of more than 3 liters and an unbreakable refill indicator.

Folding seat.--

Folding seat shall be factory fabricated with teakwood or woodgrain phenolic slats, Type 304 stainless steel tube frame with satin finish, wall bracket and hinge. Wood slats shall be factory stained and varnished. Size shall be as shown on the plans. Folding seat shall be Bradley, Bobrick, or equal.

Privacy curtain.--

Privacy curtain shall be flame resistant, one-way draw, nylon reinforced, anti-bacterial vinyl fabric. Curtain shall be 1.8 meters long.

Privacy curtain rod shall be stainless steel, fixed mounted shower rod with stainless steel mounting plates.

PART 3.- EXECUTION

Installation.--Toilet and shower accessories shall be installed in accordance with the manufacturer's recommendations. Fasteners for mounting accessories shall be concealed and tamper proof.

Expansion anchors shall be used for mounting accessories on masonry or concrete walls.

Toilet and shower accessories shall be mounted after painting work is complete.

All toilet room accessories shall be mounted plumb, secure and rigid. Grab bars shall be supported adequately so the bars will withstand an applied load of 113 kg at any point.

Support assembly for folding seat shall bear solidly on the wall without rocking and shall be fastened rigidly and securely to the wall in accordance with the manufacturer's recommendations.

SECTION 12-11. EQUIPMENT**12-11.01 WORKBENCH****PART 1.- GENERAL****SUMMARY.--**

Scope.--This work shall consist of furnishing and installing a workbench in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data and standard color palette shall be submitted for approval.

PART 2.- PRODUCTS**Workbench.--**

Workbench shall be standard, factory fabricated and factory painted heavy duty workbench unit with plywood reinforced steel top, drawers, curb and shelves. Plywood top reinforcement shall consist of two layers of securely fastened 19 mm thick exterior type plywood. The drawers, shelves and curb shall be as shown on the plans. Paint shall be an industrial grade enamel.

Leg anchors.--

Leg anchors shall be ICBO approved, integral stud type expansion anchors or internally threaded type anchors with independent stud.

PART 3.- EXECUTION

Installation.--The workbench shall be installed with the top level and the legs rigidly and securely fastened to the floor. Anchors for the legs shall be installed in accordance with the manufacturer's instructions.

12-11.02 LUBRICATION AND COMPRESSED AIR SYSTEMS**PART 1.- GENERAL****SUMMARY.—**

Scope.--This work shall consist of furnishing and installing lubrication and compressed air systems in accordance with the details shown on the plans and these special provisions.

The lubrication system shall include drum dollies; overhead hose reels and pneumatic pumps for dispensing chassis lubricant, motor oil, automatic transmission fluid, gear lubricant and ATF fluid); overhead light reel; and all connecting pipelines, hoses, accessories and mounting assemblies.

The compressed air system shall include a compressor, regulators, gauges and compressed air piping.

Pipes and fittings shall be in accordance with the requirements specified under "Pipes, Fittings, and Valves," in Section 12-15, "Mechanical," of these special provisions.

Permits to operate.--Attention is directed to the latest Division of Industrial Safety (DIS) regulations regarding tank mounted air compressors.

The Contractor shall provide all permits to operate pressure vessels in accordance with the requirements of the DIS and shall pay all costs for such permits. Such permits shall be posted under glass at the work site.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data shall be submitted for approval.

Manufacturer's descriptive data shall include a complete description, performance data and installation instructions for the materials and equipment specified herein.

Performance data shall include the product delivery rate and discharge pressure for each type of pump assembly.

CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2.- PRODUCTS

OVERHEAD HOSE REEL ASSEMBLIES.--

General.--Overhead hose reel assemblies shall be heavy duty assemblies of steel construction with connecting hoses, locking automatic ratchets, guide rollers and heavy duty spring activated hose pickups. Reels shall have bushings, swivels, ball stops, delivery hoses and control valves. The reels shall have a baked enamel finish. Manufacturers reel mounting brackets shall be supplied with reels.

Reel Controls assembly.--

The reel control assembly shall have a mechanical oscillating piston for measurement of SAE 240-non electric.

Chassis lubrication reel assembly.--

The chassis lubricant reel assembly shall have a 12 m minimum length, minimum 6 mm outside diameter, high pressure delivery hose and outlet control valve. The delivery hose shall be rated for 34.5 MPa working pressure and 137.9 MPa bursting pressure. The chassis lubricant reel assembly shall be Lincoln, 85051; Graco, 224-363, 224-417, and 202-577; or equal.

Motor oil reel assembly.--

The motor oil reel assembly shall have a 10 liter metering shutoff valve assembly with totalizer, non-drip nozzle extension, strainer and a 12 m minimum length of 13 mm inside diameter, medium pressure delivery hose. The delivery hose shall be rated for 5520 kPa working pressure and 27.6 MPa bursting pressure. The motor oil reel assembly shall be Lincoln, 83464 and 899; Graco, 224-057, 218-549, 222-648, 203-265, 157-958, and 108-478; or equal.

Automatic transmission fluid and hydraulic fluid reel assemblies .--

Automatic transmission fluid (ATF) and hydraulic fluid reel assemblies shall have a volume control valve, non-drip nozzle and 12 m minimum length of 13 mm outside diameter, medium pressure delivery hose. The delivery hose shall be rated for 5520 kPa working pressure and 27.6 MPa bursting pressure. The ATF reel assembly shall be a Lincoln, 83464 and 776; Graco, 224-057, 218-549, and 222-413; or equal.

Gear lubricant reel assembly.--

Gear lubricant reel assembly shall have an 10 liter metering shut-off valve assembly with totalizer, non-drip nozzle and a 12 m minimum length of 13 mm outside diameter, medium pressure delivery hose. The delivery hose shall be rated for 5520 kPa working pressure and 27.6 MPa bursting pressure. The gear lubricant reel assembly shall be Lincoln, 83464 and 881; Graco, 224-057, 218-549, 222-648, 201-701, 157-958 and 108-478; or equal.

PUMP ASSEMBLIES.--

General.--Pump assemblies shall be lubricant and oil type pump assemblies with air driven motors and shall be suitable for operation with stationary, exposed drums. Pump assemblies shall include pressure relief kits. Air connector hose shall be rated for 1720 kPa minimum working pressure. Product connector hose shall be as specified for the individual reel assembly. Pump assemblies shall produce the flowrates and pressures as specified under "Testing".

Chassis lubricant pump assembly.--

Chassis lubricant pump assembly shall be suitable for use with stationary, exposed 55 kg drums, complete with drum cover, air coupler and follower plate, and shall have a minimum pressure ratio of 45:1 and a maximum pressure ratio of 50:1. The chassis lubricant pump assembly shall be Lincoln, 918; Alemite, 8550; Graco, 225-014; or equal.

Motor oil, ATF and gear oil pump assemblies.—

Motor oil, ATF, Hydraulic fluid and gear oil pump assemblies shall be suitable for use with stationary, exposed 205 liter drums and equipped with a bung bushing and an air expeller in the pump tube and shall have a 76 mm air motor. The motor oil pump assembly shall be equipped with a flow compensator. Pump assemblies shall be Lincoln, 424; Alemite, 8569; Graco, 225-640; or equal.

MISCELLANEOUS COMPONENTS.--

Portable Recyclable Oil Cart.--

Portable recyclable oil cart with diaphragm waste oil pump shall be double wall rectangular upright with push handles and casters with brakes: shall be continuous weld construction double wall steel; shall have secondary containment and shall be UL 142 listed. Pump shall have 25 mm inlet and outlet and shall include air hose, filter, regulator, and automatic shut-off. Tank shall be equipped with all required ports and vents and tanks exterior shall be factory painted. Tank shall be sized as shown on plans. Acceptable manufactures shall be Containment Solutions, Model Lube Cube 240; WW Engineering Co. Model MF235, Redding Tank, or equal.

Light reel assembly.--

Light reel assembly shall be overhead type light reel with a positive reel latch cord lock mechanism, release mechanism, reel cord retractor, 9 m minimum length of 3-wire cord, 600 mm pigtail, ball stop, vapor-tight high impact phenolic plastic holder without switch or receptacle with heavy duty lamp guard and 100-watt incandescent bulb or 15-watt fluorescent tube. The incandescent light reel assembly shall be Alemite, 330005C; or equal. The fluorescent light reel assembly shall be Hi Reel, 3005-AFL; Woodhead, 945-3SW-1003-3S; or equal.

Air compressor.--

Air compressor shall be 2-stage, 1210 kPa design, 860 kPa output, mounted on an ASME code horizontal type receiver. The air compressor shall be complete with unloader, V-belt drive, belt guard, oil and air pressure gauges, automatic pressure controller, outlet valve, ASME relief valve, air intake filter, ball valve drain and an automatic tank drain operated by either the compressor unloader or a governor. Motor shall be high efficiency type, open dripproof with class B insulation. Air compressor shall be Champion, Ingersol Rand, Kellogg, or equal.

Pressure regulator.--

Pressure regulator shall be combination type with filter, bowl, pressure regulator and pressure gauge.

The filter bowl shall be the quick disconnect type, plastic with metal guard, manual drain, and 5 micron filter.

Pressure regulator shall be diaphragm controlled, balanced valve type, rated for 0 to 1100 kPa operation and shall be equipped with pressure gage, bottom clean-out plugs and internal strainers. Regulator shall be Wilkerson, Lincoln, Wabco, or equal.

Flexible coupling.--

Flexible coupling shall be brass flexible metal hose with threaded union ends and a minimum working pressure of 1380 kPa.

Pressure gage.--

Pressure gage shall be rotary type ANSI Standard: B40.1, Grade A, with 90 mm dial, liquid filled with cover, plain case, reset screw and bottom inlet. Pressure gage movement shall be phosphor bronze bushed. Gage shall read from 0 kPa to 1100 kPa. Each gage shall be equipped with a gage cock. Pressure gage shall be Marsh, Ashcroft, US Gage, or equal.

Drum dolly.--

Drum dolly shall have welded steel construction with a cross braced bottom and a 50 mm continuous perimeter lip, 4 ball bearing casters with steel or semi-steel wheels. Drum dolly shall be sized for 55 kg, drums or 205 liter drums as applicable.

PART 3.- EXECUTION

INSTALLATION.--

General.--The hose reels shall be installed rigidly and securely to the reel mounting bracket. The mounting bracket shall be attached to the wall structure as shown on the plans.

The portable recyclable oil cart shall be placed as shown on the plans.

Pipelines shall be cleaned and flushed immediately prior to connecting the control valves.

Pressure relief kits shall be installed on the discharge side of the gear lube, ATF and motor oil pumps as recommended by the pump manufacturer.

Air compressor shall be installed with drain piping, vibration isolation pads and expansion anchors.

Unions shall be installed before and after the pressure regulator/ball valve assembly.

Each pump assembly drum shall be supplied with a drum dolly.

FIELD QUALITY CONTROL.--

Testing.--All tests, including general performance tests to demonstrate the proper operation of the lubrication systems and the air compressor, shall be performed by the Contractor in the presence of the Engineer.

The air compressor system shall be tested for the operational range, the cut-off pressure and the operation of air drops and system components.

The lubrication system, including piping and hoses, shall be tested for leaks and the rates of delivery specified herein. The lubrication connections shall show no visible signs of leaks when the system is filled with the specified lubricant and tested at 1040 kPa lubricant pump inlet air pressure.

The Contractor shall demonstrate that the completed lubrication system will deliver the given product at the flowrate and discharge pressure specified by the pump assembly manufacturer. If no specification is given the lubricants shall be delivered at the following rates at 1040 kPa lubricant pump inlet air pressure:

Lubricant Material	Delivery Rate
Chassis lubricant NLGI No. 2 grease	0.7 liters per minute
Motor oil (10W/40)	7 liters per minute
Gear oil (85W/140)	6 liters per minute
ATF (SAE 10)	8 liters per minute
Hydraulic fluid	8 liters per minute

The required delivery rate values may be adjusted, as determined by the Engineer, when testing for delivery rates with different materials or at temperatures other than 21°C.

The drums and lubricating material for testing the lubrication system will be State-furnished as provided under "State-Furnished Materials" in Section 8, "Materials," of these special provisions.

12-11.03 EXHAUST EVACUATION HOSE REEL AND FAN

PART 1.- GENERAL

Scope.--This work shall consist of furnishing and installing exhaust evacuation hose reel and fan equipment, including overhead fume exhaust fan, hose reel, hose and remote operating station. All work shall be done in accordance with the details shown on the plans and these special provisions.

Supports, Mechanical and Electrical work and all other work incidental to, and necessary for, the proper installation and operation of the items of equipment shall conform to the requirements specified for similar work elsewhere in these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's description data, installation recommendations, working drawings, schematic diagram, interconnection diagram, including reel installation mounting brackets, shall be submitted for approval. Fan, hose reel and push button station shall be from same manufacturer. System shall be Nederman, CarMon or equal.

PART 2.- PRODUCTS

Exhaust evacuation fan.--

Exhaust evacuation fan shall be centrifugal AMCA certified exhaust fan suitable for diesel or gasoline powered vehicle exhaust applications. Fan parts exposed to air stream shall be coated to prevent acid corrosion. The exhaust evacuation fan shall be mounted with vibration isolators on the reel. The fan size and performance shall be as shown on plans.

Hose reel assembly.--

Hose reel assembly shall be provided with 9 m minimum of 150 mm diameter flexible hose. The hose reel shall be motor operated and shall be capable of unwinding and recoiling the hose from a remote operating station. All electrical equipment necessary for operation shall be mounted on the hose reel assembly except for the remote operating station. The hose reel motor shall be interlocked with an adjustable limit switch that stops the reel when the tubing has been fully extended or fully retracted.

Hose.--

Exhaust hose shall be fabricated of a high strength woven glass fiber cloth supported by a helically wound spring steel wire. The hose shall be capable of withstanding temperatures of 150°C and shall be supplied with a rubber nozzle of the same size as hose provided.

Pushbutton station.--

Pushbutton operating station shall consist of a 3 button (up, down, on/off) controller wired directly to the hose reel assembly. The up and down buttons shall be momentary push button type.

Control panel.--

Control panel shall be a complete system routinely advertised, furnished and guaranteed by the exhaust evacuation hose reel and fan manufacturer.

Control panel shall include circuit breakers, starters, fan motor contactor, power supply, limit switch and controls that are required for proper operation.

PART 3.- EXECUTION

INSTALLATION.—

General.--The exhaust evacuation hose reel and fan shall be installed in accordance with the manufacturer's recommendations. The exhaust evacuation units and pushbutton station shall be located as shown on the plans.

FIELD QUALITY CONTROL.--

Testing.--The test shall consist of a general performance test to demonstrate the proper operation of the exhaust evacuation hose reel and fan system. The test shall be performed by the Contractor in the presence of the Engineer.

SECTION 12-12. FURNISHINGS

12-12.01 HORIZONTAL BLINDS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing horizontal blinds in accordance with the details shown on the plans and these special provisions.

Horizontal blinds shall be standard, factory manufactured assemblies suitable for use on exterior wall windows.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, color chips, and installation instructions shall be submitted for approval.

PART 2.- PRODUCTS

Horizontal blinds.--

Horizontal blinds shall be nominal 25 mm wide, spring tempered virgin aluminum alloy horizontal slats supported by braided polyester ladders. Braided ladders shall hold slats at equal spaces, parallel, straight, and shall provide tilt control and adequate overlap of slats. The distance between ladders shall not exceed 585 mm. Slat tilt shall be adjustable by a transparent wand. Blinds shall be adjustable to any height using lift cords.

Hardware shall be enclosed in a metal head and the opening hardware shall be clinched to the head. All metal parts shall have a corrosion resistant coating.

PART 3.- EXECUTION

Installation.--Horizontal blinds shall be installed in accordance with the manufacturer's instructions.

SECTION 12-13. (BLANK)

SECTION 12-14. CONVEYING SYSTEMS

12-14.01 MOBILE VEHICLE LIFT

PART 1.- GENERAL

SUMMARY.—

Scope.--This work shall consist of furnishing and installing an above ground, 4-post, mobile vehicle lift systems and accessories in accordance with these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data for all equipment, including installation instructions, shall be submitted for approval.

Submittals shall include, but not necessarily be limited to the following:

- Assembly Drawings
- Dimensional Drawings
- Control Schematic Diagrams
- Wiring Diagrams
- Test Report Certifying Compliance with ANSI Standard B153.1.

CLOSEOUT SUBMITTALS.--

Operations and maintenance manuals--Prior to completion of the contract, 3 identified copies of the operation and maintenance instructions for the vehicle lift shall be delivered to the Engineer at the jobsite. Manuals shall be bound and shall include the following:

- Manufacturer's name
- Name, address, and telephone number of factory authorized repair facility
- Model and serial number

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Service manual shall show:

- Assembly drawings, parts list, and simplified system diagrams
- Descriptions of all equipment and their basic operating features
- Routine maintenance and service requirements
- Troubleshooting and repair procedures
- Accessories and their features and requirements

Inadequate or incomplete manuals will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

QUALITY ASSURANCE.--

Manufacturer's qualifications.--The vehicle lift shall be furnished and installed by a manufacturer or authorized representative who has not less than 5 years experience in the manufacture and installation of this type of equipment and who maintains an authorized service representative within the State of California.

Codes and standards.--All work, including equipment, materials and installation, shall conform to the California Building Standards Code, Title 24; the California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS); and the American National Standards Institute, Inc. (ANSI) Standard B153.1.

The lift including all components necessary for operation shall be tested as a unit for conformance to ANSI Standard B153.1. Where strength factors are specified, actual load tests shall be performed and the results documented. Where component assembly is specified to a particular code or standard, a statement of compliance with that code or standard shall be included. All tests shall be performed by an independent testing laboratory recognized by the Occupational Safety and Health Administration (OSHA) under the Nationally Recognized Testing Laboratories (NRTL) Recognition Program, Office of Variance Determination.

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

PART 2.- PRODUCTS

EQUIPMENT.--

Lift.--

Lift shall be comprised of four portable electrically operated components that are connected by electrical cable with every post having a main control to operate all four components. Lift shall be an electromechanical device featuring a screw drive, support base and lifting fork to raise vehicles by their wheels. The lift shall include a fail-safe mechanical locking system at each component to secure the lift at all required height positions.

Lift shall be heavy duty type with a minimum rated capacity of 27 216 kg and a minimum lifting height of 1.6 meters measured from the finish floor to the bottom of the lifting fork.

Lifting speed shall be a minimum of 508 mm per minute.

Each portable component shall be driven by an open dripproof electric motor suitable for operation on 3-phase, 208-volt, and 60 Hz service. Electrical controls for all lift components shall be designed for complete synchronized automatic operation, such that all lifting forks shall have parallel and simultaneous movement when going up or down. All movement shall be stopped if the controls are unable to maintain synchronous motion. Electrical control shall be suitable for operation on the supply voltage. Lift shall be SEFAC, No. 1200 M65BL; ARL, No. HDML-8-4; or equal

ACCESSORIES.--

Wheel adapters.--

Wheel adapters shall be included to allow lifting of large trucks with tire sizes up to 24 R 22.5 and passenger automobiles with tire sizes down to P175 80 R 13.

High lift tripod.--

Each high lift tripod shall have a lift capacity of not less than 6804 kg. Coarse adjustment of height shall be mechanically assisted using either a spring, pneumatic, or hydraulic system which will permit adjustment of the coarse height by one person. Fine adjustment of height shall be accomplished with a screw drive similar to the one used for the lift. Height shall be adjustable from 1.4 to 2 meters. A total of 8 high lift tripods shall be supplied. High lift tripod shall be SEAFAC no. TBP 530; ARI No. AB-6-20; or equal.

Information plate.--

Information plate with the following inscriptions shall be attached to the lift:

Manufacturer's name and address
Model number
Serial number
Lift capacity
Date of installation
Statement of compliance with ANSI B153.1

PART 3.- EXECUTION

INSTALLATION.--

General.--All equipment shall be installed in accordance with the vehicle lift manufacturer's recommendations and the applicable codes.

FIELD QUALITY CONTROL.--

TESTS.--

Acceptance tests.--Testing of the vehicle lift shall be conducted by the Contractor in the presence of the Engineer, using a State-furnished vehicle under various loads up to the maximum specified. If the lift malfunctions or a failure develops, the parts causing the failure shall be replaced or repaired and the test repeated until the vehicle lift performs satisfactorily. The electric motors shall not exceed the full load current as listed on the nameplate of the motor.

The Contractor shall notify the Engineer in writing not less than 5 days prior to the time that the testing is scheduled.

Manufacturer's field service.--The Contractor shall arrange for a manufacturer's authorized representative at the site of the work to supervise installation, check start-up, and train State personnel.

DEMONSTRATION.--

Training.--The Contractor shall arrange instruction and training for up to 6 State personnel on the operation and maintenance of the equipment. Training shall be scheduled with the Engineer to occur within 2 weeks of the installation of the hoist. Training shall include 8 hours of instruction on equipment operation and maintenance.

12-14.02 FREESTANDING BRIDGE CRANE AND HOIST

PART 1.- GENERAL

SUMMARY.--

Scope.--This work consists of designing, constructing, furnishing and installing a 2700-kilogram freestanding electric bridge crane with an electric powered hoist on a motorized trolley, in accordance with the details shown on the plans, the requirements specified in these special provisions, and the recommendations and instructions of the hoist manufacturer.

The work shall also include the design, construction, furnishing and installation of a self supported runway system consisting of bi-directional moment frames, crane runway rails, and the bridge girder for the trolley and hoist.

SYSTEM DESCRIPTION.--

Design requirements.--The self supported runway system consisting of bi-directional moment frames, crane runway rails, and the bridge girder shall be designed to support the crane and hoist loads, including the required safety factors, as recommended by the crane and hoist manufacturer for the crane capacity specified herein and as recommended by the Materials Handling Institute Standard No. 74, "Top Running and Underhung Single Girder Electric Overhead Traveling Cranes," and as required by Title 24 of the California Building Standards Code, Title 8 of the California Code of Regulations and the 1998 California Building Code.

The crane runway rails shall be located as shown on the plans. The approximate spacing of the structural steel support frames shall be as shown on the plans. The minimum vertical clearance shall be as shown on the plans.

The bridge girder shall be designed for the span between the crane runways. The approximate length of span between the crane runways shall be as shown on the plans. Final span length shall be determined by the manufacturer. The length of travel of the trolley at each end shall be determined by the Contractor and shall be the maximum that can be attained while maintaining adequate operating clearances between the crane assembly and the building in which it is installed.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, performance data, parts list and installation instructions for the bridge crane and hoisting equipment shall be submitted for approval.

Working drawings.--Working drawings and design calculations for the self supported runway system consisting of bi-directional moment frames, crane runway rails and bridge girder shall be submitted for approval.

Working drawings shall include control panel schematic and wiring diagram, and a listing of electrical equipment and devices to be furnished.

Working drawings and design calculations shall be stamped and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California.

CONTRACT CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

QUALITY ASSURANCE.--

Certificate of Compliance.--Certificates of compliance shall be furnished for the bi-directional moment frames, crane runway rails, and bridge girder in accordance with the requirements specified in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Codes and standards.--All welding shall be in accordance with the requirements in American Welding Society (AWS) D14.1, "Specifications for Welding Industrial and Mill Crane and Other Material Handling Equipment."

PART 2.- PRODUCTS

MANUFACTURERS.--

Acceptable manufacturers.--Subject to project conditions, freestanding bridge crane and hoist shall be CraneVeyor Corp.; Detroit Hoist; ARI or equal.

MANUFACTURED UNITS.--

General.--The electric bridge crane with a 2700-kilogram capacity shall include an electric powered hoist on a motorized trolley, power bar conductors, unit switches and pendant-type electrical controls.

The bridge crane shall be a 2700-kilogram capacity, motor driven, underhung, single girder type crane. Bridge crane shall include bridge girder, end trucks, wheels, crane drive shaft, motor drive head, and drive motor. Bridge crane speed shall be 15 meters per minute.

The hoist and trolley shall be a 2700-kilogram, close headroom, wire rope hoist mounted on a single-speed, electric motor driven trolley.

Crane control system shall consist of a bridge girder mounted control panel, festooned bridge conductor system, conductor bar system, travel limit switches, fully solid-state softstart for the bridge crane and trolley motors, and 7 button pendant station complete with strain relief hardware for full operation of hoist, trolley and bridge. Controls shall be actuated by the pendant station.

COMPONENTS.--

Bridge girder and trucks.--

Bridge girder shall be fabricated from structural steel conforming to ASTM Designation: A 36, and shall have a maximum deflection of 1/600 of the span length under maximum loading conditions. The bridge girder shall be provided with travel stops.

The end trucks shall be designed to run on the lower flange of the runway rails and shall be constructed of welded structural steel shapes conforming to ASTM Designation: A 36. The end trucks shall be motorized and shall have not less than 4 forged steel wheels with sealed, tapered roller bearings.

The drive motor shall be a single gear driven motor with a common drive shaft or a dual drive motor system. The drive motor shall be rated for Class C Service, crane travel duty, and shall be reversible with motor brake. Horsepower, voltage and phase shall be as shown on the plans.

The crane drive shaft for single motor operation shall be supported on lubricated pillow blocks with precision ball bearings.

Hoist and trolley.--

The trolley shall be motorized and shall have not less than 4 hardened forged steel wheels with sealed, tapered roller bearings. The trolley frame shall be of rigid construction. The trolley operating speed shall be nominal 12 meter per minute. The trolley motor shall be continuous duty, reversible, with motor brake. Hoist shall have bi-directional limit switches. Trolley shall have a load limit clutch or current sensor. The hoist and trolley shall include unit switches. Power requirements, voltage and phase shall be as shown on the plans.

The hoist shall be oil bath gear driven flanged drum with machined grooves, mechanical type disc brake, heavy duty ball bearings, have a high limit switch for the hook travel, and shall be equipped with a load limiting clutch to prevent damage from overloads. Hook shall be forged steel, with 360 degree swivel and spring latch. The hoist motor shall be continuous duty, reversible, with motor brake. Power requirements, voltage and phase shall be as shown on the plans.

Runway rails and moment frames.--

Runway rails and moment frames shall be fabricated from structural steel conforming to ASTM Designation: A 36. The rails shall have a maximum deflection of 1/600 of the span length under maximum loading conditions. The runway rails shall be provided with travel stops.

Control panel.--

Control panel shall be UL or FM listed for crane operation and shall include main disconnect, mainline contactor, hoist motor disconnect, bridge motor disconnect, trolley motor disconnect, hoist motor reversing starter, bridge motor reversing starter, trolley motor reversing starter, thermal overload relays, control transformer disconnect, control transformer, control relays, power terminal block and control terminal block. All contactors and starters shall be NEMA rated. Components shall be mounted on the interior mounting panel.

Control panel shall be a NEMA 12 enclosure, with interior mounting panel and hinged exterior dead front door. Control panel shall be factory prewired in conformance with Class-II Type 1C wiring. All wires entering or leaving the control panel shall terminate on terminal blocks. Control wires shall be 7 strand No. 14 Type MTW wires. Wiring shall be arranged such that any component may be removed without removing any wiring except that component's leads.

Control panel shall be a complete system, routinely advertised, furnished by the bridge crane and hoist manufacturer.

Power and control cable.--

Power and control cable shall be as recommended by the bridge crane and hoist manufacturer.

Festooned bridge conductor system.--

Festooned bridge conductor system shall consist of multi-conductor cable, cable grip, messenger chain, tag-line wire, 50 mm (inside diameter) conductor cable rings, take up brackets, 10 mm eye-bolts and other necessary hardware. Conductor sizes shall be as recommended by the hoist and trolley manufacturer.

Conductor bar system.--

Conductor bar system shall consist of enclosed power conductors, collectors and related covers, hangers, couplings and appurtenances. Conductor bar system shall be rated for 600 volts, 90 amperes continuous duty and 135 amperes intermittent duty. Conductor bars shall be one piece, copper conductors with thermoplastic insulating covers. End covers shall be provided. Collectors shall be spring loaded, replaceable shoe type rated for 150 meters per minute (minimum) travel.

FABRICATION.--

Shop finishing.—Freestanding bridge crane and hoist shall be cleaned and receive 2 coats of the manufacturer's standard paint.

Identification.—An information plate, with the following information, shall be attached to the bridge crane hoist and trolley.

Manufacturer's name and address
Model number
Serial number
Crane capacity
Hoist capacity
Date of installation

PART 3.- EXECUTION

INSTALLATION.--

General.--The bridge crane and hoist shall be installed in accordance with the manufacturer's instructions and the approved working drawings.

Crane runway sections shall be installed with couplings at joints to provide flush and level connections with a maximum gap between adjacent ends at the load-carrying flange not exceeding 2 mm except at free ends.

The bottom flanges of all crane runways shall be parallel and level with one another within a tolerance of plus or minus 6 mm throughout their entire length.

Hanger system shall provide for vertical adjustment of the runway beams so that the runways can be erected and maintained within level tolerance.

The crane control panel shall be mounted on the crane bridge and shall be actuated from a pendant station, suspended 1.2 meters above the floor. Main power and trolley power shall be by festooned bridge conductor system and shall be installed along the bridge crane from the control panel to the conductor bar system and trolley motor.

Each soft start unit for the bridge and trolley motors shall be enclosed in a NEMA 12 enclosure and may be installed near the bridge or trolley motor.

Power and control cables shall be fastened to the structural members with one-hole steel straps at a spacing of not to exceed 0.9 meter on center.

Field painting.--After installation, damaged and abraded areas of the shop paint shall be repainted using the same materials as applied in the shop.

FIELD QUALITY CONTROL.--

Tests.--The bridge crane and hoist shall be tested in the presence of the Engineer. Any equipment failure or malfunction shall be corrected by the Contractor at his expense.

Tests shall be as described herein:

NO LOAD TEST.--The trolley and hoist shall be operated to throughout the full length of the crane runways and the limits of hook travel. Travel limit switches shall be engaged.

LOAD TEST.--The minimum test load shall be 125 percent of the rated load capacity. The trolley shall be operated for the full length of the crane runways under the test load. The test load shall be raised to the hook height limit and lowered until the cable is slack. After a 5-minute waiting period, the test load shall be raised one foot and held in that position, without slipping, for a minimum time period of ten minutes.

LOSS OF POWER TEST.--The main power switch shall be opened while the test load is being lowered. The test load shall stop completely and immediately when the power switch is opened.

Manufacturer's field service.--The Contractor shall arrange for the bridge crane manufacturer's representative to be present during testing.

SECTION 12-15. MECHANICAL

12-15.01 MECHANICAL WORK

GENERAL.--

Scope.--This work shall consist of performing mechanical work in accordance with the details shown on the plans and these special provisions.

Mechanical work shall include furnishing all labor, materials, equipment and services required for providing heating, ventilating, air conditioning, plumbing and natural gas distribution systems.

Earthwork, foundations, sheet metal, painting, electrical, and such other work incidental and necessary to the proper installation and operation of the mechanical work shall be in accordance with the requirements specified for similar type work elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of pipes, ducts, etc., and location of equipment is to be governed by structural conditions and obstructions. Equipment requiring maintenance and inspection is to be readily accessible.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed, manufacturer's descriptive data, and such other data as may be requested by the Engineer shall be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for plumbing fixtures, and component layout shall be included where applicable.

Manufacturer's descriptive data shall be submitted for the following:

- Economizer working drawings
- Water hammer arrestor
- Access door
- Trap seal primer valve
- Compression stop
- Hose faucet
- Pipe insulation
- Cleanouts
- Valve boxes
- Floor drain
- Water closet
- Urinal
- Lavatory
- Lavatory carrier
- Lavatory and sink faucets
- Mop sink
- Kitchen sink
- Water heaters
- Electric water cooler
- Emergency shower and eyewash
- Gate valves
- Ball valves
- Balancing dampers
- Unit heater
- Heat-vent-light combination
- Supply fan
- Exhaust fans
- Evaporative coolers
- Air conditioning units
- Thermostats
- Thermostat guard
- Time switches
- Diffusers
- Registers
- Air grilles
- Duct insulation
- Duct liner
- Ductile iron pipe and fittings
- Backflow preventer
- Detector check
- Fire hydrant
- Gas regulator

Wye strainer
Check valve
Air Compressor
Combination heating/cooling unit
Vehicle exhaust system
Bridge crane
Ceiling supply transfer fan
Fume exhaust fan
Declassification fan
Wheel chair accessible shower unit
Gas meter
Lube system
Lube cart
Vehicle lift
Portable Recycle Oil Cart
Barometric Relief Damper
Pipe Metal.
Pipe Plastic.

CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be indexed and bound in a manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Operation and maintenance manuals shall be submitted for the following equipment:

Air conditioning units
Evaporative coolers
Exhaust fans
Electric water cooler
Unit heaters
Thermostats
Exhaust evacuation hose reel
Bridge crane
Declassification fan
Fume exhaust fan
Fire hydrant
Vehicle Lift
Lube system

Economizer working drawings

QUALITY ASSURANCE.--

Codes and standards.--Mechanical work, including equipment, materials and installation, shall conform to the California Building Standards Code, Title 24, and to the California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety (DIS).

WARRANTY.--

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

12-15.02 PIPE, FITTINGS AND VALVES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing pipes, fittings and valves in accordance with the details shown on the plans and these special provisions. Pipe, fittings and valves shall include such plumbing and piping accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the plumbing and piping systems.

All piping insulation and wrapping material shall be in accordance with the requirements specified under "Mechanical Insulation," in this Section 12-15.

Cathodic protection for underground piping shall be in accordance with the requirements specified under "Cathodic Protection," in Section 12-16, "Electrical," of these special provisions.

The pipe sizes shown on the plans are nominal pipe size. No change in the pipe size shown on the plans shall be permitted without written permission from the Engineer.

The pipe and fitting classes and material descriptions shall be as specified herein. No change in class or description shall be permitted without written permission from the Engineer.

QUALITY ASSURANCE.--

Codes and standards.--Pipe, fittings and valves shall be installed in accordance with the requirements in the 2001 California Plumbing Code, the manufacturer's recommendations and the requirements specified herein.

PART 2.- PRODUCTS

MATERIALS.--

PIPE AND FITTINGS --

Class	Description
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A1.--

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with 1040 kPa galvanized malleable iron banded screwed fittings and galvanized steel couplings. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

A2.--

Schedule 40 galvanized steel pipe conforming to ASTM Designation: A 53, with black cast iron recessed drainage fittings. For rainwater leaders, neoprene-gasket compression couplings, Smith Blair, Dresser, or equal, may be used. The weight of the zinc coating shall be not less than 90 percent of that specified in ASTM Designation: A 53.

B1.--

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with screwed fittings suitable for working pressure involved, but not less than 1210 kPa. Fittings shall be listed for fire protection.

B2.--

Schedule 40 black steel pipe conforming to ASTM Designation: A 53, with 1040 kPa black malleable iron banded screwed fittings and black steel couplings.

Steel pipe coating, where required, shall be factory applied plastic. Pipe coating shall be Standard Pipe Protection, X-Tru-Coat (0.50 mm thick); Pipe Line Service Corporation, Republic; 3M Company, Scotchkote 205 (0.30 mm thick); or equal.

C1.--

Hub and plain end cast iron soil pipe with neoprene gaskets conforming to Cast Iron Soil Pipe Institute's Standard 301. Pipe, fittings and gaskets shall be of one manufacturer.

C2.--

Hubless cast iron soil pipe with neoprene gaskets, corrugated stainless steel shields and stainless steel clamps conforming to Cast Iron Soil Pipe Institute's Standard 301. Joint materials shall be furnished by pipe manufacturer.

D1.--

Ductile iron push on joint pipe conforming to AWWA Designation: C151. Fittings shall be push on ductile iron conforming to AWWA Designation: C153. Joints shall be rubber gasketed and designed for a working pressure of 2420 kPa. Pipe and fittings shall be supplied with bituminous outer coating and cement lining. Pipe shall be listed for fire protection.

H1.--

Type DWV hard copper tubing conforming to ASTM Designation: B 306, with DWV drainage fittings, stop type couplings and threaded adapters.

H2.--

Type K hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

H3.--

Type L hard copper tubing conforming to ASTM Designation: B 88, with wrought copper or cast bronze solder joint pressure fittings, stop type couplings and threaded adapters. Solder shall be lead-free.

LP1.--

2.1 mm thick seamless steel tubing with high pressure flareless steel tube fittings. Bends, if required, shall be made with tube bender on 115 mm minimum radius.

LP2.--

0.9 mm thick seamless steel tubing with high pressure flareless steel tube fittings. Bends, if required, shall be made with tube bender on 115 mm minimum radius.

P2.--

Polyvinyl chloride (PVC) plastic pipe and fittings conforming to ASTM Designation: D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 1380 kPa working pressure at 23°C, National Sanitation Foundation approved. Pipe shall have bell ends conforming to ASTM Designation: D 3139 with triple edge rubber sealing ring. For pipe sizes 50 mm diameter and smaller, plain end pipe with solvent welded fittings ASTM Designation: D 2241, Type I, Grade 1, Standard Dimension Ratio (SDR) 21, rated for 1380 kPa may be used.

P3.--

Polyvinyl chloride (PVC) standard weight pipe and fittings, Schedule 40, conforming to ASTM Designation: D 1785. Pipe shall meet or exceed requirements of National Sanitation Foundation Standard No. 14. Pipe shall have bell ends conforming to ASTM Designation: D 2672. For pipe sizes 75 mm and smaller, plain end pipe with solvent welded fittings conforming to ASTM Designation: D 2241, may be used.

P4.--

Polyvinyl chloride (PVC) plastic pipe and fittings shall conform to AWWA Designation: C900, class 150, Standard Dimension Ratio (SDR) 18. Pipe shall have bell end with a solid cross section elastomeric ring conforming to ASTM Designation: D 3139. Pipe shall be listed for fire protection.

P5.--

Polyethylene plastic gas pipe and fittings conforming to ASTM Designation: D 1248 and D 2513 with Standard Dimension Ratio (SDR) 11, rated for 415 kPa working pressure at 23°C, socket type fittings, joined by heat fusion.

P6.--

Polyvinyl chloride (PVC) natural gas pipe, Class 315, conforming to ASTM Designation: D 2513. Fittings shall be Schedule 40 conforming to ASTM Designation: D 2513, and shall be primed and glued. Primer shall conform to ASTM Designation: F656. Solvent cement shall conform to ASTM Designation: D2564. Approved adapters shall be used for transition to other pipe materials.

Unions (for steel pipe).--

Unions (for steel pipe) shall be 1730 kPa, threaded malleable iron, ground joint, brass to iron seat, galvanized or black to match piping.

Unions (for copper or brass pipe).--

Unions (for copper or brass pipe) shall be 1040 kPa cast bronze, ground joint, bronze to bronze seat with silver brazing threadless ends or 860 kPa cast brass, ground joint, brass to brass seat with threaded ends.

Unions (for brass waste and flush pipes).--

Unions (for brass waste and flush pipes) shall be slip or flange joint unions with soft rubber or leather gaskets. Unions shall be placed on the fixture side of the traps.

Dielectric waterway.--

Dielectric waterway shall be a premanufactured unit that incorporates an insulated interior lining at least 75 mm in length between the 2 pipes being connected while maintaining metal to metal contact on the exterior surface. Dielectric water way shall be listed by IAPMO (International Association of Plumbing and Mechanical Officials).

Insulating union.--

Insulating union or flange as applicable shall be suitable for the service on which used. Connections shall be constructed such that the 2 pipes being connected are completely insulated from each other with no metal to metal contact. Insulating couplings shall not be used. Insulating union shall be F. H. Maloney; Central Plastics; EPCO; or equal.

Insulating connection (to hot water tanks).--

Insulating connection (to hot water tanks) shall be 150 mm minimum, flexible copper tubing with dielectric union at each end and designed to withstand a pressure of 1040 kPa and a temperature of 93°C.

VALVES.--

Gate valve (65 mm and smaller).--

Gate valve (65 mm and smaller) shall be bronze body and trim, removable bonnet and non rising stem, Class 125 and same size as pipe in which installed. Gate valve shall be Crane, 438; Nibco Scott, T-113; Jenkins, 370; or equal.

Gate valve in nonferrous water piping systems may be solder joint type with bronze body and trim. Valve shall be Kitz, 59; Nibco Scott, S-113; Jenkins, 1240; or equal.

Gate valve (75 mm and larger, above ground).--

Gate valve (75 mm and larger, above ground) shall be iron body with bronze trim, removable bonnet and non-rising stem, class 125 and same size as pipe in which installed. Gate valve shall be Crane, 461; Nibco Scott, F-619; Jenkins, 326; or equal.

Gate valve (75 mm and larger, below ground).--

Gate valve (75 mm and larger, below ground) shall be AWWA double disc, hub or rubber ring type, removable bonnet and non-rising stem, equipped with operating nuts, 1380 kPa working pressure, and Tee handle wrench for each valve. Valve shall be Mueller, A-2380; American Valve, Model 28; or equal.

Ball valve.--

Ball valve shall be two piece, minimum 2760 kPa WOG, bronze body and chrome plated or brass ball with full size port. Valve shall be Nibco Scott, T-580; Watts, B-6000; Kitz, 56; or equal.

Gas valve.--

Gas valve shall be natural gas service type, bronze body, quarter turn, flathead and rated for 860 kPa. Gas valve shall be Crane, American or equal.

Check valve (50 mm and larger).--

Check valve (50 mm and larger) shall be silent wafer type, full faced for installation between 860 kPa flanges, iron body with bronze trim, nylon or teflon disc, stainless steel helical spring and shaft, Class 125 and same size as pipe in which installed. Check valve shall be APCO, Series 300; CPV, 10D; Metraflex, Series 900; or equal.

Trap primer.--

Trap primer shall be bronze body with removable operating parts and gasketed cover. Primer shall be designed for horizontal in-line installation and have an integral vacuum breaker. Trap primer shall be Jonespec, 77250; Zurn, Z1022, Josam, 88250; or equal.

FAUCET AND HYDRANTS.--**Hose faucet.--**

Hose faucet shall be compression type, angle pattern, wall flange at exterior locations, tee handle, 20 mm female thread with hose end, rough chrome or nickel plated finish for locations inside building, rough brass finish for others. Hose faucet shall be supplied with an integral or nonremovable threaded outlet vacuum breaker which meets the requirements of the American Society of Sanitary Engineering (ASSE) Standard: 1011. Hose faucet shall be Nibco, No. 63VB; Chicago, No. 13T; or equal.

Fire hydrant.--

Fire hydrant shall conform to the requirements of AWWA Designation: C503. Fire hydrant shall have 150 mm inlet, and have one nominal size 4 outlet steamer hose and two nominal size 2 1/2 outlets. Fire hydrant shall be Jones, Model J-3765; Rich, Model 960; American Cast, Darling Division, Mark-73; or equal.

CLEANOUTS.--**Cleanout through wall.--**

Cleanout through wall shall be cast iron cleanout tee type with polished stainless access plates. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, No. W-8460; Smith, No. 4532; Zurn, No. 1445; or equal.

Cleanout through floor.--

Cleanout through floor shall have nonslip scoriated nickel bronze access plate and adjustable frame with square pattern top for ceramic tile and round pattern top for other finishes. Where floors are constructed with a membrane, access frame shall be provided with membrane clamping flange. Plug shall be countersunk brass or bronze with tapered threads. Cleanout shall be Wade, W-7000 Series; Smith, 4023 Series; Zurn, No. 1400; or equal.

Cleanout through floors in exterior locations shall be heavy duty, floating pipe type with cast iron cover. Cleanouts shall be Wade, No. W-8300-HF; Smith, No. 4253; Zurn, No. 1474; or equal.

Cleanout to grade.--

Cleanout to grade shall be cast iron ferrule type. Plug shall be countersunk brass or bronze with tapered threads. Cleanout to grade shall be Wade, No. W-8450; Smith, 4420; Zurn, No 1440; or equal.

MISCELLANEOUS ITEMS.--**Water hammer arrestor.--**

Water hammer arrestor shall be stainless steel body with bellows or piston. Arrestor compression chambers shall be pneumatically charged. Water hammer arrestors shall be tested and certified in accordance with the Plumbing and Drainage Institute Standard: PDI-WH201 and sized as shown on the plans.

Access door.--

Access door shall be 1.52 mm prime coated steel, face mounting square frame, minimum 300 mm x 300 mm door with concealed hinge and screwdriver latch.

Compression stop (exposed).--

Compression stop (exposed) shall be metal full free waterway, angle type, ground joint union, non-rising stem, molded rubber seat and wheel handle.

Compression stop (concealed).--

Compression stop (concealed) shall be long neck, built-in compression stops for required wall thickness, loose key and exposed parts polished chromium plated. Supplies shall be Chicago, 1771; California Brass, No. 172; or equal.

Gas regulator.--

Gas regulator shall be listed as suitable for gas and equipped with full capacity relief valve, low pressure safety shut-off and weatherproof and insect proof vent for outside installation. Capacity shall be as shown on the plans. Gas regulator shall be Fisher; Reliance; Rockwell; or equal.

Wye strainer.--

Wye strainer shall be wye pattern, cast iron body and Type 304 stainless steel or monel strainer screen. The strainer screen shall have an open area equal to at least 3 times the cross sectional area of the pipe in which it is installed and shall be woven wire fabric with 20 mesh or perforated sheet with 850 micron maximum diameter holes.

Backflow preventer.--

Backflow preventer shall be factory assembled with 2 check valves, one pressure differential relief valve, 2 ball valves and 4 test cocks. Backflow preventers shall be of the approved type reduced pressure principle devices listed by the East Bay Municipal Utility District, P.O Box 24055, Oakland, CA. 94623, Telephone (510) 287-0837.

Pipe hanger (for piping supported from overhead).--

Pipe hanger (for piping supported from overhead) shall be Grinnell, Model 269; Super Struct, C711; or equal.

Pipe wrapping tape and primer.--

Pipe wrapping tape shall be pressure sensitive polyvinyl chloride or pressure sensitive polyethylene tape having nominal thickness of 0.50 mm. Wrapping tape shall be Polyken, 922; Manville, Trantex VID-20; Scotchrap, 51; or equal.

Pipe wrapping primer shall be compatible with the pipe wrapping tape used.

Floor, wall, and ceiling plates.--

Floor, wall, and ceiling plates shall be chromium plated steel or plastic plates having screw or spring clamping devices and concealed hinges. Plates shall be sized to completely cover the hole.

Valve box.--

Traffic rated valve box shall be precast high density concrete with polyethylene face and cast iron traffic rated cover marked "WATER," "GAS" or "CO-SS" as applicable. Extension shall be provided as required. Valve box shall be Christy, B3; Brooks Products Company, 3TL; Frazer, 3; or equal.

Roof drain.--

Roof drain shall be cast iron body, with integral flashing clamp and gravel stop with seepage openings, 400 mm nominal polyethylene low profile dome, 75 mm caulk or no-hub outlet and underdeck clamp. Roof drain shall be J. R. Smith, 1010; Zurn, Z-100; Wade, W-3500; or equal.

Floor drain.--

Floor drain shall be cast iron body and flashing collar, adjustable nickel bronze 150 mm strainer head with seepage openings and caulk or no-hub outlet. Floor drain shall be round or square as shown on the Architectural plans. Floor drain shall be J. R. Smith, 2005/2010; Wade, W-1100; Zurn, Z-415; or equal.

PART 3.- EXECUTION**INSTALLATION.--****INSTALLATION OF PIPES AND FITTINGS.--**

Pipe and fittings.--Pipe and fittings shall be installed in accordance with the following designated uses:

Designated Use	Pipe and Fitting Class
Domestic water (CW and HW) in buildings	H3 or A1
Domestic water underground within 1.5 m of the building	A1 or H2
Domestic water underground 1.5 m beyond the building	P2, P3, P4, A1 or H2
Fire protection water, underground	B1,D1 or P4
Sanitary drain piping above ground in building	H1, C1, or C2
Sanitary drain and vent piping underground within 1.5 m of the building	C1 or C2
Sanitary vent piping above ground in building	A2, H1, C1, or C2
Natural gas, above ground	A1 or B2
Natural gas, underground	B2 (plastic coated), P5 or P6
Lubrication piping, less than 30 m in length	LP1 (16 mm outside diameter)
Lubrication piping, over 30 m in length	LP1 (22 mm outside diameter)
Gear oil, motor oil, and automatic transmission fluid (ATF) piping; less than 8 m in length	LP2 or H3 (16 mm outside diameter)
Gear oil, motor oil, and ATF piping; over 8 m in length	LP2 or H3 (22 mm outside diameter)
Compressed air	A1
Equipment drains and relief valve discharge	H3 or A1

Installing piping.--Water piping shall be installed generally level, free of traps and bends, and arranged to conform to the building requirements.

Piping installed underground shall be tested as specified elsewhere in these special provisions before backfilling.

Public use areas, offices, rest rooms, locker rooms, crew rooms, training rooms, storage rooms in office areas, hallway type rooms, and similar type use areas shall have concealed piping.

Warehouse rooms, equipment bays, and loft areas shall have exposed piping.

Piping shall not be run in floor fill, or on floor except as shown on the plans.

Piping shall be installed parallel to walls. All obstructions shall be cleared, headroom preserved and openings and passageways kept clear whether shown or not. Piping shall not interfere with other work.

Where pipes pass through exterior walls, a clear space around pipe shall be provided. Space shall be caulked water tight with silicone caulk.

Underground copper pipe shall have brazed joints. Underground plastic pipe shall be buried with No. 14 solid bare copper wire. Wire ends at pipe ends shall be brought up 200 mm and looped around pipe.

Exposed supply and drain piping in rest rooms shall be chrome finished.

Piping and tubing for hydronic heating shall be installed in accordance with the requirements specified under "Hydronic Heating System," elsewhere in this Section 12-15.

Compressed air piping shall be pitched to low point. Ball valved drips shall be provided at all low points. Branches shall be taken off top of main.

Gas piping shall not be installed under building concrete slabs or structure. An insulating connection and valve shall be installed above ground at each building supply.

Gas piping shall be pitched to equipment or to low point and provided with a 200 mm minimum dirt leg.

Plastic pipe used for natural gas shall be below grade outside of building only. Transition to Class B2 plastic coated shall be before meter, regulator, or building wall with approved metal to plastic transition fitting. PVC natural gas pipe shall be installed in accordance with International Association of Plumbing and Mechanical Officials (IAPMO) Standard: IS10.

Forty-five degree bends shall be used where offsets are required in venting. Vent pipe headers shall be sloped to eliminate any water or condensation.

Vent piping shall extend a minimum of 200 mm above the roof.

Horizontal sanitary sewer pipe inside buildings shall be installed on a uniform grade of not less than 2 percent unless shown otherwise on the plans.

Drainage pipe shall be run as straight as possible and shall have easy bends with long turns.

Wye fittings and 1/8 or 1/16 bends shall be used where possible. Long sweep bends and combination Wye and 1/8 bends may be used only for the connection of branch pipes to fixtures and on vertical runs of pipe.

Water pipe near sewers.--Water pipe shall not be installed below sewer pipe in the same trench or at any crossing, or below sewer pipe in parallel trenches less than 3 m apart.

When a water pipe crosses above a sewer pipe, a vertical separation of at least 300 mm between the top of the sewer and the bottom of the water pipe shall be maintained.

When water and sewer pipe is installed in the same trench, the water pipe shall be on a solid shelf at least 300 mm above the top of the sewer pipe and 300 mm to one side.

Pipe sleeves.--The Contractor shall provide sleeves, inserts and openings necessary for the installation of pipe, fittings and valves. Damage to surrounding surfaces shall be patched to match existing.

PVC pipe sleeves shall be provided where each pipe passes through concrete floors, footings, walls or ceilings. Inside diameter of sleeves shall be at least 20 mm larger than outside diameter of pipe. Sleeves shall be installed to provide at least 10 mm space all around pipe the full depth of concrete. Space between pipes and pipe sleeves shall be caulked watertight.

Pipe penetrations in fire rated assemblies.--Where pipes pass through fire rated wall, floor or ceiling assemblies, the penetration shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping," in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

Cutting pipe.--All pipe shall be cut straight and true and the ends shall be reamed to the full inside diameter of the pipe after cutting.

Damaged pipe.--Pipe that is cracked, bent or otherwise damaged shall be removed from the work.

Pipe joints and connections.--Joints in threaded steel pipe shall be made with teflon tape or a pipe joint compound that is nonhardening and noncorrosive, placed on the pipe and not in the fittings.

The use of thread cement or caulking on threaded joints will not be permitted. Threaded joints shall be made tight. Long screw or other packed joints will not be permitted. Any leaky joints shall be remade with new material.

Exposed polished or enameled connections to fixtures or equipment shall be made with special care, showing no tool marks or threads.

Cleaning and closing pipe.--The interior of all pipe shall be cleaned before installation. All openings shall be capped or plugged as soon as the pipe is installed to prevent the entrance of any materials. The caps or plugs shall remain in place until their removal is necessary for completion of the installation.

Securing pipe.--Pipe in the buildings shall be held in place by iron hangers, supports, pipe rests, anchors, sway braces, guides or other special hangers. Material for hangers and supports shall be compatible with the piping or neoprene isolators shall be used. Allowances shall be made for expansion and contraction. Steel pipe shall have hangers or supports every 3 m. Copper pipe 25 mm or smaller shall have hangers or supports every 2 m and sizes larger than 25 mm shall have hangers or supports every 3 m. Plastic pipe shall have hangers or supports every 1 m. Cast iron soil pipe with neoprene gaskets shall be supported at each joint. Vertical pipes shall be supported with clamps or straps. Horizontal and vertical piping shall be securely supported and braced to prevent swaying, sagging or flexing of joints.

Hangers and supports.--Hangers and supports shall be selected to withstand all conditions of loading to which the piping and associated equipment may be subjected and within the manufacturer's load ratings. Hangers and supports shall be spaced and distributed so as to avoid load concentrations and to minimize the loading effect on the building structure.

Hangers and supports shall be sized to fit the outside diameter of pipe or pipe insulation. Hangers shall be removable from around pipe and shall have provisions for vertical adjustment after erection. Turnbuckles may be used.

Materials for holding pipe in place shall be compatible with piping material.

Hanger rods shall be provided with locknuts at all threaded connections. Hanger rods shall be sized as follows:

Pipe Size	Minimum Hanger Rod Diameter
15 mm to 50 mm	10 mm
65 mm to 87 mm	13 mm
100 mm to 125 mm	16 mm
150 mm	19 mm

Wrapping and coating steel pipe.--Steel pipe buried in the ground shall be wrapped or shall be plastic coated as specified herein:

1. Wrapped steel pipe shall be thoroughly cleaned and primed as recommended by the tape manufacturer.
2. Tapes shall be tightly applied with 1/2 uniform lap, free from wrinkles and voids with approved wrapping machines and experienced operators to provide not less than 1.00 mm thickness.
3. Plastic coating on steel pipe shall be factory applied. Coating imperfections and damage shall be repaired to the satisfaction of the Engineer.
4. Field joints, fittings and valves for wrapped and plastic coated steel pipe shall be covered to provide continuous protection by puttying and double wrapping with 0.50 mm thick tape. Wrapping at joints shall extend a minimum of 150 mm over the adjacent pipe covering. Width of tape for wrapping fittings shall not exceed 50 mm. Adequate tension shall be applied so tape will conform closely to contours of fittings. Putty tape insulation compounds approved by the Engineer shall be used to fill voids and provide a smooth even surface for the application of the tape wrap.

Wrapped or coated pipe, fittings, and field joints shall be approved by the Engineer after assembly. Piping shall be placed on temporary blocks to allow for inspection. Deficiencies shall be repaired to the satisfaction of the Engineer before backfilling or closing in.

Thrust blocks.--Thrust blocks shall be formed by pouring concrete between pipe and trench wall. Thrust blocks shall be sized and so placed as to take all thrusts created by maximum internal water pressure.

Plastic pipe underground shall be provided with thrust blocks and clamps at changes in direction of piping, connections or branches from mains 50 mm and larger, and all capped connections.

Union.--Unions shall be installed where shown and at each threaded or soldered connection to equipment and tanks. Unions shall be located so piping can be easily disconnected for removal of equipment or tanks. Unions shall be omitted at compression stops.

Dielectric waterway.--Dielectric waterway shall be provided between metal pipes of different material, and between brass or bronze valves and steel piping.

Insulating union and insulating connection.--Insulating union and insulating connection shall be provided where shown and at the following locations:

1. In metallic water, gas and air service connections into each. Insulating connections shall be installed on the exterior of the building, above ground and after shut-off valve.
2. In water, gas and air service connections in ground at point where new metallic pipes connect to existing metallic pipes. Install valve box above insulating connection.
3. At points of connections of copper or steel water pipes to steel domestic water heaters and tanks.
4. At each end of buried ferrous pipe protected by cathodic protection.

Bonding at insulating connections.--Interior water piping and other interior piping that may be electrically energized and are connected with insulating connections shall be bonded in accordance with the California Electrical Code. Bonding shall all be coordinated with electrical work.

Compression stop.--Each fixture, including hose faucets, shall be equipped with a compression stop installed on water supply pipes to permit repairs without shutting off water mains. Ball valves may be installed where shown on the plans or otherwise permitted by the Engineer.

INSTALLATION OF VALVES.--

Pressure reducing valve.--A capped tee connection and strainer shall be installed ahead of the pressure reducing valve.

Exterior valves.--Exterior valves located underground shall be installed in a valve box marked "Water." Extensions shall be provided as required.

INSTALLATION OF FAUCETS AND HYDRANTS.--

Hose faucet and hydrants.--Faucets and hydrants shall be installed with outlets 0.5 m above finished grade.

INSTALLATION OF CLEANOUTS.--

Cleanouts.--A concrete pad 0.5 m long and 100 mm thick shall be placed across the full width of trench under cleanout Wye or 1/8 bend. Cast iron soil pipe (C1 or C2) and fittings shall be used from Wye to surface. Required clearance around cleanouts shall be maintained.

Cleanout risers outside of a building installed in a surface other than concrete shall terminate in a cleanout to grade. Cleanout to grade shall terminate in a valve box with cover marked "CO-SS". Top of box shall be set flush with finished grade. Cleanout plug shall be 100 mm below grade and shall be located in the box to provide sufficient room for rodding.

Cleanout risers installed in tile and concrete floors, including building aprons and sidewalks, shall terminate in a cleanout through floor.

INSTALLATION OF MISCELLANEOUS ITEMS.--

Water hammer arrestor.--Water hammer arrestor shall be installed so that they are vertical and accessible for replacement. Water hammer arrestor shall be installed with access door when in walls or there is no access to ceiling crawl spaces. Access door location shall be where shown on the plans or as approved by the Engineer.

Gas appliance connection.--Gas valve and flexible connector shall be provided for gas piping at each appliance. Appropriately rated gas cocks may be used in 15 mm gas pipe. Cock or valve shall be within one meter of the appliance.

Gas regulator.--Gas regulator shall be installed complete with dirt leg, capped test tee, union, insulating union, gas valve and fittings.

Backflow preventer.--Backflow preventer assembly shall include a wye strainer, backflow preventer, fittings and pipe. Assembly components shall be the same size as the pipe in which they are installed unless otherwise shown on the plans.

Backflow preventer shall be installed a minimum of 400 mm above ground and shall be the same size as the pipe in which it is installed unless otherwise shown on the plans.

Flushing completed systems.--All completed systems shall be flushed and blown out.

Chlorination.--The Contractor shall flush and chlorinate all domestic water piping and fixtures.

Calcium hypochlorite granules or tablets, if used, shall not be applied in the dry form, but shall first be dissolved into a solution before application.

The Contractor shall take adequate precautions in handling chlorine so as not to endanger workmen or damage materials. All pipes and fittings shall be completely filled with water containing a minimum of 50 ppm available chlorine. Each outlet in the system shall be opened and water run to waste until a strong chlorine test is obtained. The line shall then be closed and the chlorine solution allowed to remain in the system for a minimum of 24 hours so that the line shall contain no less than 25 ppm chlorine throughout. After the retention period, the system shall be drained, flushed and refilled with fresh water.

FIELD QUALITY CONTROL.--

Testing.--The Contractor shall test piping at completion of roughing in, before backfilling, and at other times as directed by the Engineer.

The system shall be tested as a single unit, or in sections as approved by the Engineer. The Contractor shall furnish necessary materials, test pumps, instruments and labor and notify the Engineer at least 3 working days in advance of testing. After testing, the Contractor shall repair all leaks and retest to determine that leaks have been stopped. Surplus water shall be disposed of after testing as directed by the Engineer.

The Contractor shall take precautions to prevent joints from drawing while pipes and appurtenances are being tested. The Contractor shall repair damage to pipes and appurtenances or to other structures resulting from or caused by tests.

General tests.--All piping shall be tested after assembly and prior to backfill, pipe wrapping, connecting fixtures, wrapping joints and covering the pipe. Systems shall show no loss in pressure or visible leaks.

The Contractor shall test systems according to the following schedule for a period of not less than 4 hours:

Test Schedule		
Piping System	Test Pressure	Test Media
Sanitary sewer and vent	3.0 M head	Water
Water	860 kPa	Water
Gas (except P6)	690 kPa	Air
Gas (P6)	350 kPa	Air
Air	860 kPa	Air
Lubrication piping	860 kPa	Air and Product

During testing of water systems, valves shall be closed and pipeline filled with water. Provisions shall be made for release of air.

Sanitary sewers shall be cleared of obstructions before testing for leakage. The pipe shall be proved clear of obstructions by pulling an appropriate size inflatable plug through the pipe. The plug shall be moved slowly through the pipe with a tag line. The Contractor shall remove or repair any obstructions or irregularities.

Testing backflow preventers.--Backflow preventers installed by the Contractor shall be tested at the completion of the supply system installation for proper operation by a certified Backflow Preventer Tester.

The tester shall hold a valid certificate as a Backflow Preventer Tester from the county in which the device to be tested is located or, if the county does not have a certification program for Backflow Preventer Testers, the tester shall have a certificate from one of the following:

1. The American Water Works Association.
2. A county which has a certification program for Backflow Preventer Testers. The certification under which the tester has been certified shall be acceptable to the water purveyor and the local agency having jurisdiction.

Testing for proper operation shall conform to the procedures of the county in which the testing is being performed, or, if such procedures are not available in the county, such tests shall conform to the provisions in the latest edition of the Guidance Manual For Cross Connection Control Program, which is available from the California Department of Health Services, Division of Drinking Water and Environmental Management, 601 N 7th Street, P.O. Box 942732, Sacramento, CA 94234.

The Contractor shall notify the Engineer at least 5 days prior to testing backflow preventers. Such tests shall be satisfactorily completed after installation of the backflow preventer assemblies and before operation of the systems.

One copy of all test results for each backflow preventer shall be furnished to the Engineer.

Full compensation for providing the certified Backflow Preventer Tester and for testing the backflow preventers shall be considered as included in the lump sum price paid for building work and no additional compensation will be allowed therefor.

12-15.03 MECHANICAL INSULATION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing mechanical insulation in accordance with the details shown on the plans and these special provisions.

Piping insulation shall be installed on all domestic hot water piping, above grade, in non-conditioned spaces.

P-trap, hot water supply pipes and angle valves for lavatories and sinks, except in janitor closets or similar enclosed spaces, shall be insulated.

Duct insulation shall be installed on all rigid ductwork installed in concealed non-conditioned spaces.

Duct liner shall be installed in all rectangular ductwork installed in exposed non-conditioned spaces and in exterior locations. Plenum liner shall be installed in all plenums in non-conditioned spaces or in walls facing a non-conditioned space.

QUALITY ASSURANCE.--

Codes and standards.--Mechanical insulation shall conform to California State Energy Commission regulations and, where applicable, shall meet American Society of Testing and Materials (ASTM) standards.

All materials shall bear the label of the Underwriters Laboratory (UL) or other approved testing laboratory indicating that the materials proposed for use conform to the required fire hazard ratings.

Pipe safety insulation shall conform to Section 1504(b) of Title 24, Part 5, California Plumbing Code.

PART 2.- PRODUCTS

MATERIAL.--

General.--All pipe insulation and wrapping material, including adhesives and jackets, located within buildings shall be certified to have a composite flame spread rating of not more than 25 and smoke development rating of not more than 450 when tested in accordance with ASTM Designation: E 84.

Duct insulation and wrapping material, including adhesives and jackets, located within buildings shall be certified to have a composite flame spread of not more than 25 and smoke development rating of not more than 50 when tested in accordance with ASTM Designation: E 84.

Domestic water and piping insulation.--

Piping insulation shall be glass fiber molded pipe insulation with factory applied jacket suitable for service temperatures up to 175°C. Covering jacket shall have pressure sealing lap adhesive joints. Pipe insulation shall have a minimum thermal resistance of $R-0.5 \text{ K}\cdot\text{m}^2/\text{W}$. Insulation and jackets shall be Owens-Corning, Fiberglass 25 with ASJ/SSL All Service Jacket; Manville, Micro-Lok 650ML with AP-T All Purpose Jacket; or equal.

Piping insulation cement.--

Insulation cement shall be Fenco, All Purpose Cement; Manville, JM375; or equal.

Exterior piping insulation

Piping insulation shall be polyurethane foam insulation with a service temperature range of 0°C to 120°C. A 0.15 mm vapor barrier shall be applied over the top off the insulation. The vapor barrier shall be installed with an adhesive as recommended by the manufacturer.

PVC jacket.--

PCV jacket shall be rated for a service temperature of 80°C. PVC jacket shall include covers specifically designed to cover pipe fittings.

Alternative pipe insulation.--

Alternative pipe insulation shall be closed cell, elastomeric material in a flexible tubular form. Insulation shall have a service temperature range between -40°C and 93°C, a minimum vapor transmission rating of 0.29 Perm-m, and a minimum thermal resistance of $R-0.5 \text{ K}\cdot\text{m}^2/\text{W}$.

Pipe safety insulation.--

Pipe safety insulation for P-traps, hot water supply pipes and angle valves shall be molded closed cell vinyl or closed cell foam with exterior vinyl surface. Pipe safety insulation shall be configured to protect against contact. Pipe safety insulation shall be Truebro Inc., Handi Lav-guard; Plumberex Specialty Products, Handy Shield; or equal.

External duct insulation.--

External duct insulation shall be 38 mm thick, 0.5 kg density glass-fiber blanket type. Material and coatings shall be fire resistive and shall be approved by the State Fire Marshal. External duct insulation shall be Fiberglas, Type PF-336; Ultralite, No. 100; Pittsburgh Plate Glass, Superfine; Johns-Manville, Microlite; Silvercote, Silvercel; or equal.

Plenum and duct liner.--

Plenum and duct liner shall be 25 mm minimum thickness. Material and coatings shall be fire resistive and shall be approved by the State Fire Marshal. Liner shall be Gustin-Bacon, Ultra-Liner duct insulation; Owens-Corning Fiberglas, Type CE; Gustin-Bacon, coated insulation Board No. 90-A; Owens-Corning Fiberglas 0.7 kg density coated flexible duct liner; Johns-Manville, MicroBar, or 0.7 kg density coated Microlite; Pittsburgh Plate Glass, Superfine 0.7 kg density coated interior duct insulation; or equal.

Adhesive.--

Adhesive shall be non-flammable type: Benjamin Foster Company, No. 85-20 Spark Safe; Goodloe E. Moore Company, Tuff Bond No. 6; Permacel, No. PA-310; 3M, No. 38 Insulation Adhesive; Swift's, No. 7228 brush type or No. 7336 spray type; Chicago Mastic, 17-461; or equal.

Studs.--

Studs shall be cement-in-place type, pneumatic driven type or percussive welding type, and shall have 25 mm minimum diameter washers.

Insulation inserts.—

Insulation inserts at pipe hangers supports for pipes 50mm or larger shall be calcium silicate, cellular glass, or other acceptable material of the same thickness as the adjacent insulation and not less than 6 kg density.

PART 3.- EXECUTION**INSTALLATION.--**

General.--Insulation materials shall be neatly installed with smooth and even surfaces, jackets drawn tight and smoothly cemented down.

Insulation material shall not be installed until all pipes or surfaces to be covered are tested for leaks, cleaned and dried, and foreign materials, such as rust, have been removed.

Piping insulation.--Piping insulation shall be in accordance with the following, except that unions, unless integral with valves, and flexible connections shall not be insulated.

- a. Where insulation butts against flanges or is discontinued, insulation shall be tapered to pipe to allow for covering jacket to completely seal off end of insulation.

Insulation shall be extended on the valve bodies up to the valve bonnet.

Extend insulation continuous through pipe hangers and pipe sleeves. At hangers where pipe is supported, provide an insulated protection shield.

Insulating cement shall be applied to fittings, valves, and strainers and troweled smooth to thickness of adjacent covering. Strainer cleanout plugs shall remain accessible. Covers fabricated from molded pipe covering may be used in lieu of cement, provided covers are neat and well secured.

- b. Jacket flap shall be sealed down with factory applied self-sealing lap. Seams shall be lapped not less than 40 mm. Jacket shall be secured with aluminum bands installed at 300 mm centers.
- c. Exposed outdoor insulation shall have an additional 0.40 mm minimum thickness aluminum jacket applied over the completed insulation. The jacket shall have a factory applied moisture barrier and shall be Childers; Smith; or equal.

End joints shall be lapped with aluminum holding traps located directly over the lap. Additional aluminum holding straps shall be placed at 200 mm centers. Jacket at ells and tees shall be mitered, or premanufactured fitting jackets shall be provided, with additional aluminum holding bands, as required. All joints shall be sealed watertight using silicon type, heat resistant sealant.

- d. In-ground insulation shall have an additional PVC jacket applied over the completed insulation and vapor barrier. PVC jacket shall be made water with adhesive or sealant as recommended by the PVC jacket manufacturer.

Alternate pipe insulation, where used, shall be installed on hot water piping before connections are made or the insulation may be slit lengthwise, applied to pipe and sealed with adhesive.

Pipe safety insulation.--Pipe safety insulation shall be installed in accordance with the manufacturer's recommendations.

Duct insulation.--Ragged edges shall be repaired or taped. Coverings shall be neatly finished at joints and edges. Each joint shall have a 50 mm minimum lap.

Where transitions are made between externally covered ducts and lined ducts, the lined duct shall be overlapped 200 mm with external covering.

Insulation shall be flush with but not cover control devices, damper controls or access doors.

Before insulation is wrapped around concealed ducts, an adhesive shall be spot applied at a maximum of 100 mm centers on each side of the ducts to prevent sagging of the insulation. Insulation shall be wrapped entirely around the ducts and shall be wired securely in place with No. 16 copper clad wire, metal bands at least 10 mm wide or plastic ties. Supports shall be spaced a maximum of 300 mm on centers. Metal bands shall be installed with the use of a banding machine. Seams in the insulation shall be taped.

The finished insulation covering shall be even and level and shall not contain humps.

Plenum and duct liner.--Plenums and exposed ducts shall be lined with plenum and duct liner. Plenums and ducts shall be sized to provide the clear inside dimensions shown on plans after the liner is installed.

The insulation shall be applied with coated side exposed to air stream to prevent surface erosion.

The lining shall be fastened in place with adhesive and with studs with washers spaced a maximum of 500 mm on center each way.

Applying adhesive.--The adhesive shall be liberally applied over entire interior surfaces of ducts or plenums.

Stud installation.--Studs shall be installed as follows:

- a. Cement-In-Place Type Studs.--Cement-in-place type studs shall be cemented in place with adhesives manufactured for this purpose and shall be as recommended by the stud manufacturer. Cement-in-place type studs shall be used where concrete walls form part of plenum.
- b. Percussive Welding Type Studs.--Percussive welding type studs shall be carefully welded in place with current settings that will not appreciably burn galvanizing on opposite side of the sheet metal.

Pneumatic Driven Type Studs.--At locations where pneumatic driven type studs are used, hardened steel backup plates or dollies shall be used under the sheet metal.

12-15.04 PLUMBING FIXTURES

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing plumbing fixtures in accordance with the details shown on the plans and these special provisions.

PART 2.- PRODUCTS

General.--Plumbing fixtures shall be white in color and shall meet the following requirements:

Water closet (disabled accessible, 6 liters per flush, floor mounted with tank).--

Disabled accessible water closet shall be 6 liters per flush maximum, vitreous china, siphonable jet, 410 mm to 440 mm high elongated bowl, close coupled tank, floor mounted, with solid plastic open front elongated seat with check hinges. Water closet shall meet or exceed Americans with Disabilities Accessibility Act Guidelines (ADAAG) and ANSI Standards: A117.1 and A112.19.2. Closet and accessories shall be of the following types or equal:

	American Standard	Crane	Universal Rundle
Closet	"Cadet 17 EL1.6/PA" 2168.100 or 4086.800	"Hymont" 3-154E or 3-152 with3-655	"Atlas 1.5" UR 4078-341 or UR 4078-342
Seat	Church 5321.070	Olsonite 95	Benke 527

Water closet (6 liters per flush, floor mounted with tank).--

Water closet shall be 6 liters per flush maximum, vitreous china, siphon jet, elongated bowl, close coupled tank, floor mounted, with solid plastic open front elongated seat with check hinges. Tank shall be water pressurized air reservoir type. Water closet shall meet or exceed ANSI Standard: A112.19.2. Closet and accessories shall be the following types or equal:

	American Standard	Crane	Kohler
Closet	"Cadet EL 1.6/PA" 2292.100	"Economiser" 3-604	"Wellworth" K-3458
Seat	Olsonite 95	Church 5321.070	"Lustra" K-4670-C

Urinal.--

Urinal shall be vitreous china, wall hung, washout, 20 mm top spud, integral shields, spreader and trap. Urinal and valve shall be of following types or equal:

	American Standard	Crane	Kohler
Urinal	"Washbrook" 6501.010	"Cromwell" 7-187	"Bardon" K-4960-T
Flush valve	Exposed, diaphragm type, chrome plated, with oscillating handle, integral control stop, adjustable tail piece and vacuum breaker suitable for use with 20 mm spud urinals.		

Urinal (disabled accessible).--

Urinal shall be vitreous china, wall hung, siphon jet or washout, top spud, integral shields, spreader and trap, with 380 mm maximum extension from wall. Urinal and valve shall meet Americans with Disabilities Accessibility Act Guidelines (ADAAG) and shall be of following types or equal:

	American Standard	Crane	Kohler
Urinal	"Allbrook" 6540.017	"Manhattan" 7-109	"Bardon" K-4960-T
Flush valve	Exposed, diaphragm type, chrome plated, with oscillating handle, integral control stop, adjustable tail piece and vacuum breaker suitable for use with top spud urinals.		

Lavatory (wall-mounted).--

Lavatory shall be vitreous china, with back, integral perforated grid drain, drilled for 102 mm centers, size 508 mm x 457 mm, with single extra long lever mixing faucet and chair carrier with concealed arms. Lavatory shall be equipped with temperature controls to limit the hot water supply to 43°C. Lavatory and accessories shall be of the following types or equal:

	Eljer	Crane	Kohler
Lavatory	"Lucerne" 0355.012	"Norwich" 1-194-V	"Greenwich" K-2032
Drain	--	C-1065-G or Moen 52659	K-7715
Supplies	Brass Craft FR1711C	C-1151 or Moen 52664	K-7605
Faucet	2385.130	Moen 8400	K-15592-5
Trap	32 mm chromium plated brass exposed bent tube adjustable 1.37 mm (17-gage) minimum thickness.		
Carrier	Concealed wall mounted carrier with leveling screws and locking devices; Zurn, J.R. Smith, Josam, Wade, Jonespec, or equal.		

Lavatory (counter mounted).--

Lavatory shall be self-rimming vitreous china, integral perforated grid drain, drilled for 102 mm centers, nominal bowl size 254 mm x 457 mm, with single extra long lever mixing faucet. Lavatory and accessories shall be of the following types or equal:

	American Standard	Eljer	Kohler
Lavatory	"Aqualyn" 0476.028	"Kathy" 051-3334	"Rondelle" K-2185
Drain	2411.015	803-052	K-7715
Supplies	Brass Craft FR1711C	801-0111	K-7606
Faucet	Moen 8425	-----	15592-5
Trap	32 mm chromium plated brass exposed bent tube adjustable 1.37 mm (17-gage) minimum thickness.		

Mop sink.--

Mop sink shall be acid resisting enameled cast iron, 711 mm x 711 mm outside dimensions, 75 mm trap, vinyl coated rim guard, vacuum breaker faucet with hose and wall hook. Sink and accessories shall be of the following types or equal:

	American Standard	Eljer	Kohler
Mop sink	"Florwell" 7740.020	"Custodial" 242-0050	"Whitby" K-6710
Strainer	7721.038	803-0630	K-9146
Faucet	8344.111	749-1450	K-8928

Kitchen sink.--

Kitchen sink shall be constructed of 18-gage minimum stainless steel with full undercoating. Sink shall be single compartment, self-rimmed with ledge for faucet. Normal bowl size shall be 533 mm x 381 mm with an outside depth of 178 mm or less. Sink shall be supplied with stainless steel strainer and chrome p-trap. Kitchen sink faucet shall be metal body, chrome plated, single lever mixing type with 200 mm long spout aerator and replaceable ceramic cartridge.

Water heater (electric).--

Water heater shall be minimum capacity as shown on plans, designed for minimum 860 kPa, interlocking (non-simultaneous) or single element, glass lined, and equipped with magnesium anodes, cold water drop tube, high temperature energy shut-off device, valved drain, high density R-1.4 K•m²/W minimum foam insulation and finished with a steel jacket with baked enamel finish. Water heater shall meet the requirements of the California Energy Commission.

Water heater shall be equipped with an ASME labeled, tank mounted, pressure and temperature relief valve sized for maximum input.

Water heater (gas).--

Water heater shall be minimum capacity as shown on plans, designed for minimum 860 kPa, glass lined, and equipped with gas pressure regulator, magnesium anodes, cold water drop tube, high temperature energy shut-off device, valved drain, high density R-1.4 K•m²/W minimum foam insulation and finished with a steel jacket with baked enamel finish. Water heater shall meet the requirements of the California Energy Commission.

Water heater shall be equipped with an ASME labeled, tank mounted, pressure and temperature relief valve sized for maximum input.

Electric water cooler (disabled accessible, wall mounted).--

Electric water cooler shall be two station, dual height, wall mounted, barrier free, and shall produce a minimum of 28 liters of 10°C water per hour based upon an inlet water temperature of 27°C and an ambient room temperature of 32°C. Cooler shall have self closing, front controls, requiring less than 35 kilo pascal force to activate, and/or automatic sensor operation, shielded bubbler, automatic stream regulator, loose key stop, adjustable thermostat and cast brass P-trap.

Compressor shall be hermetically sealed, positive start with fan cooled condenser and shall be mounted above the cooler top. Cooler shall be provided with 3-wire grounded plug and cord.

Manufacturer shall be Haws, HWBFA8L; Sunroc, NWCA-8F-BLN; Elkay, EZOSTL-8; or equal.

Emergency eyewash and shower.--

Emergency eyewash and shower shall be separate drench shower and eye bath, 32 mm minimum, galvanized steel pipe stand with 229 mm floor mounting flange and equipped with 216 mm x 279 mm pictorial and worded emergency identification sign.

Shower head shall have a 254 mm diameter ABS plastic head with a stay-open ball valve operated by a rigid pullrod with triangular handle.

Eyewash shall have a 254 mm diameter stainless steel bowl, anti-surge heads and circular chrome plated spray ring to bathe the entire face, dust cover assembly, and a stay-open ball valve operated by a flag handle. Eyewash unit shall be mounted on the shower pipe stand.

Emergency eyewash and shower shall be Haws, 8346; Speakman, SE-607; Western, 9231; or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.--All finish for exposed metal on any fixture, including wall flanges, bolts, nuts and washer, shall be polished chrome plated.

Fixtures shall be sealed to wall or floor with silicone caulk bead.

All exposed metal surfaces on fixture supports shall be enameled to harmonize with fixtures.

Wall mounted fixtures shall be installed on concealed chair carriers designed to support weight of fixture from the floor, made for the specific fixture to be supported and for the particular installation conditions.

All fixtures, including showers, shall be provided with accessible metal stop valves.

Hot water supply, trap and tailpiece on lavatories shall be wrapped with insulating material.

Flush valves for fixtures designated on the plans as disabled accessible shall be installed so that the valve handle is on the widest side of the toilet space.

FIXTURE MOUNTING HEIGHTS.--

General.--Unless otherwise noted, fixtures shall be mounted at the heights shown on the plans.

Mop sink.--Mop sink double faucet shall be mounted on wall above sink back with spout outlet face one meter above the floor.

Water heater.--Water heater shall be installed with seismic restraints, inlet ball valve and insulating connections, and 20 mm pressure and temperature relief drain pipe.

Emergency eyewash and shower.--Emergency eyewash and shower shall be installed with a rigid bracket located 1.2 m above the floor. Bracket shall be minimum 1.52 mm (16-gage) steel and shall be braced to the wall.

FIELD QUALITY CONTROL.--

Testing.--The Contractor shall test piping in accordance with the requirements specified elsewhere in these special provisions.

All installed fixtures shall be tested for proper operation after all plumbing work has been completed.

12-15.05 WHEELCHAIR ACCESSIBLE SHOWER UNIT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a wheelchair accessible shower unit and fittings in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, installation instructions and color palette shall be submitted for approval. The color will be selected from the manufacturer's standard product line by the Engineer after approval of the contract.

QUALITY ASSURANCE.--

Codes and standards.--Shower units shall conform to the requirements of the California State Accessibility Standards contained in the California Building Standards Code, Title 24.

PART 2.- PRODUCTS

Shower stall.--

Shower stall shall be single unit, single piece construction with clear interior dimensions of 1065 mm wide, 1220 mm deep, with an entrance width of 915 mm, and no obstruction at the threshold. Shower stall shall be fabricated from gel-coated fiberglass or acrylic with a Class I Flame Spread. Shower unit shall be reinforced to accommodate the grab bars and seat.

Shower unit shall have a threshold or recessed drop, a maximum of 13 mm in height, sloped at an angle not exceeding 45 degrees from the horizontal. The floor shall be slip-resistant, sloping a maximum of 4 percent to a drain located near the rear wall.

Shower unit shall be provided with the following fittings and accessories: stainless steel corner grab bar and folding teakwood or woodgrain phenolic wheelchair transfer seat, each capable of resisting 1112 N of lateral, vertical and tensile load, stainless steel soap dish, chromium plated or stainless steel curtain rod, chromium plated steel hand-held shower head with ball joint, chromium plated 1525 mm long flexible shower spray hose, chromium plated fixed shower head, chromium plated metal outlet drain with removable strainer, chromium plated single lever control thermostatic mixing valve with control cartridge with no metal to metal wearing surface, a lever operated shower head selector, and vinyl shower curtain with corrosion resistant hooks.

Shower stall units shall be Crane; Florestone; or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.--Shower shall be installed with the manufacturer's instructions. All joints shall be sealed and caulked watertight.

12-15.06 SHOWER STALL

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a shower stall in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--

Product data.--Manufacturer's descriptive data, installation instructions and color palette shall be submitted for approval. The color and finish will be selected from the manufacturer's standard product line by the Engineer after the award of the contract.

PART 2.- PRODUCTS

Shower stall.--

Shower stall shall be single unit, one-piece construction, fabricated from glass fiber reinforced polyester resin and provided with the following fittings and accessories: soap dish, chromium plated metal or stainless steel curtain rod, chromium plated steel showerhead with ball joint, chromium plated steel bent arm and wall flange, chromium plated metal outlet drain with removable strainer, chromium plated single-handle control thermostatic mixing valve that has control cartridge with no metal to metal wearing surfaces, and vinyl plastic shower curtain with noncorrosive curtain hooks. Shower stall unit shall be American Standard, Model 132; Florestone Florentine, Model 32-3W; or equal.

PART 3.- EXECUTION

INSTALLATION.--

General.--The shower stall shall be installed in accordance with the manufacturer's recommendations. Installation shall be sealed and caulked watertight.

12-15.07 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

PART 1.- GENERAL

Scope.--This work shall consist of furnishing, installing and testing heating, ventilating and air conditioning (HVAC) equipment and systems in accordance with the details shown on the plans and these special provisions.

The performance rating and electric service of the HVAC equipment shall be as shown on the plans.

Temperature controls.--Thermostats, relays, timer switches, and other sensor type control devices required for this work shall be furnished and installed by the supplier of the heating, ventilating and air conditioning equipment. All temperature control wiring shall be furnished and installed in accordance with the requirements specified in Section 12-16, "Electrical," of these special provisions.

Codes and standards.--Equipment and systems shall conform to California State Energy Commission Regulations and, where applicable, shall be American Refrigeration Institute (ARI), American Gas Association (AGA), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), and Air Movement and Control Association (AMCA) approved for performance ratings and application shown on the plans.

Any appliance for which there is a California standard established in the Appliance Efficiency Standards may be installed only if the manufacturer has certified to the Commission, as specified in those regulations, that the appliance complies with the applicable standards for that appliance. Space conditioning equipment may be installed only if the

manufacturer has certified that the equipment meets or exceeds all applicable efficiency requirements listed in the Energy Efficiency Standards.

PART 2.- PRODUCTS

HEATING AND COOLING UNITS.--

Combination heating/cooling unit (single package - rooftop).--

Combination heating/cooling unit shall be standard, commercial quality, single package, curb pump mounted unit with weatherproof acoustically lined cabinet. The cabinet shall have convenient access panels and a baked-on enamel finish. The roof curb shall be insulated and shall be supplied by the unit manufacturer.

Unit shall be provided with positive pressure combustion and mechanical flue gas venting and furnace safety controls.

Compressor shall be hermetically sealed unit, vibration isolated, short cycling protection, pressure relief valve, high and low pressure switches, liquid-line filter-dryer and crankcase heater.

Combination unit shall have auxiliary contacts to de-energize system when smoke detectors indicate the presence of smoke.

Indoor air blower shall be adjustable V-belt drive type. The fan and fan motor shall provide the specified air flow, with wet coil, against the external static pressure as noted on the plans.

Motors shall have integral thermal overload protection.

Unit shall be provided with an economizer.

Economizer.--

Economizer shall be modulating type assembly either provided by the manufacturer or fabricated to match the unit. The economizer shall be complete with damper motor and linkage for full range modulation of the outdoor and return air dampers, barometric damper, screened rain hoods, factory wiring for convenient connections, automatic compressor lockout, minimum position damper control, and air filters sized to have a maximum velocity of 125 meters per minute, all installed in an enclosure similar in color to the basic unit with paint applied by the manufacturer of the economizer. Barometric damper area shall be equal to outside air intake area and be capable of relieving 100 percent of the rated air conditioning unit. The economizer shall be constructed to meet SMACNA requirements and working drawings shall be submitted prior to fabrication.

Evaporative cooler.—

Evaporative cooler shall be a factory assembled unit having removable side panels with filters and drain. The cabinet shall be fabricated from galvanized steel sheet metal with a baked-on enamel finish. Interior surfaces of the cabinet bottom shall be asphalt coated. The drain fitting shall be threaded for connection to drain piping.

All parts of the float valve and recirculating pump, which come into contact with water, shall be of stainless steel or other corrosion resistant material.

The evaporative cooler shall come with a four position selector switch for "OFF-PUMP-COOL-VENT." The wiring of the selector switch shall be as shown on the drawings

The evaporative cooler shall be Williams; Essick; Universal; or equal.

Unit heater.--

Unit heater shall be gas-fired, propeller fan type, AGA approved for natural gas and shall be equipped with aluminized steel heat exchanger, built in backdraft diverter, fan switch marked "SUMMER"- "WINTER," adjustable discharge louvers, gas pressure regulator, intermittent ignition device, gas main and pilot shutoff valves, automatic gas valve, high limit shutoff, 24-volt transformer, and fan motor local disconnect. All components shall be factory assembled. Unit heater shall be Reznor; Modine; Hastings; or equal.

Unit heater fan motor shall have integral thermal overload protection.

Heat pump (wall mounted).--

Heat pump shall be wall mounted, through-the-wall type with backup electrical resistance heating, rotary type compressor, and shall include slide-out chassis design, thermostat, adjustable discharge grilles, multi-speed fan, and integral thermal overload protection. Unit shall have provision to allow for fresh air into the room automatically. Units shall be Friedrich, Mitsubishi Electric, Toshiba, or equal.

FANS AND VENTILATORS.--

Exhaust fan (ceiling mounted).--

Exhaust fan shall be ceiling mounted, AMCA certified and shall be equipped with grille, backdraft damper and metal housing. Exhaust fan motor shall have integral thermal overload protection. Ceiling exhaust fan shall be Breidert, ILG, Penn, or equal.

Declassification fan (roof mounted).--

Declassification fan shall be roof mounted, centrifugal type, AMCA certified, direct drive, aluminum blades, metal housing, venturi orifice, and safety grills. Declassification fan shall be constructed in accordance with the requirements of the latest of AMCA Publication 99, "Standards Handbook."

Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan motor shall be 3-phase, continuous duty and explosion proof with integral thermal overload protection.

Roof declassification fan shall be supplied with roof mount curb, motor side guard, backdraft damper and weatherhood. Weatherhood shall be galvanized steel with bird screen. All parts shall be supplied by the fan manufacturer.

Fume Exhaust Fan (roof mounted).--

Fume exhaust fan shall be roof mounted, centrifugal type, AMCA certified, direct drive, aluminum blades, metal housing, venturi orifice, and safety grills. Fume exhaust fan shall be constructed in accordance with the requirements of the latest of AMCA Publication 99, "Standards Handbook."

Fan motor and fan assembly shall be isolated from base with rubber vibration isolators. Fan motor shall be 3-phase, continuous duty and explosion proof with integral thermal overload protection.

Roof fume exhaust fan shall be supplied with roof curb, flashing, motor side guard, backdraft damper and weatherhood. Weatherhood shall be galvanized steel with bird screen. All parts shall be supplied by the fan manufacturer.

Fan shall be AMCA certified and exhaust fan motor shall be equipped with integral thermal overload protection and local disconnect.

Combination heat/vent/light fan.--

Combination heat/vent/light fan shall be ceiling mounted, recessed type unit with metal housing, grille and backdraft damper. Ducting size shall be as required by the manufacturer. Combination heat lamp/light/fan shall be Broan, No. 164; Nutone, No. 9427; or equal.

HVAC CONTROLS.--

Unit heater thermostat.--

Unit heater thermostat shall be low voltage type, single set point range internally adjustable from 4°C to 27°C, and provided with a blank cover.

Thermostat (office only).--

Thermostat shall be 24-volt, 7-day programmable, electronic heating/cooling thermostat, with the ability to program the fan-on mode during normal working hours, and fan-off mode during unoccupied periods. Thermostat shall be provided with sub-base selector switches for "AUTO-HEAT-OFF-COOL" and fan "AUTO-ON". Thermostat shall be auto-changeover type, and have full temperature range setback capacity. Thermostat shall be Robertshaw, 7900; Honeywell, T7300; or equal.

Thermostat guard.--

Thermostat guard shall be clear plastic w/lockout key cover thermostat guard shall be Dayton, Honeywell, or equal.

Time switch.--

Time switch shall be one-hour, spring-wound, "OFF" type time switch without a "HOLD" feature. Time switch shall be Intermatic, Type F60M; Tork, A500 Series; or equal.

AUXILIARY HVAC COMPONENTS.--

Unless specified herein, all components shall be sized and have the characteristics as shown on the plans.

Rigid ductwork.--

Rigid ductwork shall be galvanized steel sheet metal conforming to the latest edition of the SMACNA "Low Velocity Duct Construction Standards." Galvanized steel shall be cleaned by washing with mineral spirit solvent sufficient to remove any oil, grease or other materials foreign to the galvanized coating.

Spiral duct.--

Spiral duct shall be prefabricated type.

Duct supports.--

Duct supports shall be hot-dip galvanized steel.

Flexible ductwork.--

Flexible ductwork shall be UL 181, Class 1 air duct rated and shall meet the requirements of NFPA 90-A. Duct shall have steel helix wire, flexible insulation, minimum thermal resistance of $R-0.7$ ($m^2 \cdot K/W$), and flame resistant vapor barrier. Inner and outer surfaces shall be non-metallic. Outer surface shall be Copolymer or Mylar, factory applied.

Flexible connection.--

Flexible connection shall be prefabricated type and shall be commercial quality flexible glass fabric coated on both sides with neoprene or hypalon.

Ceiling diffuser (for gypsum board ceilings).--

Ceiling diffuser for gypsum board ceilings shall be rectangular or square type. Diffuser shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, equipped with a removable core and a standard flanged frame with sponge rubber or felt gasket. Diffuser shall have individually adjustable curved blades, counter-sunk screw holes, shall be surface mounted, with face velocity less than 3.05 m/s; Titus, 250; Air Mate, 400-O; Hart and Cooley, A40; or equal.

Return register (for gypsum board ceilings).--

Return register for gypsum board ceilings shall be rectangular or square, and shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, fixed bar type, die formed louvers set at 45 degrees, 13 mm spacing maximum, surface mounted; Titus, 335; Air Mate, 280; or equal.

Ceiling diffuser (for suspended ceilings).--

Ceiling diffuser for suspended ceilings shall be 610 mm square. Diffuser shall be steel with oven baked-on enamel bone white dull finish or extruded aluminum, perforated face hinged for easy access, and shall be fitted with fully

adjustable air pattern controllers, a removable core, and a standard flanged frame; Titus, PAS; Air Mate, 700; or equal.

Return register (for suspended ceilings).--

Return register for suspended ceilings shall be 610 mm square, steel or extruded aluminum, perforated face hinged for easy access; Air Mate, 700RA; Titus, PAR; or equal.

Volume damper.--

Volume damper shall be opposed blade type, operable from face with screw driver or Allen-head wrench, shall be same manufacturer as diffuser or may be furnished as part of the diffuser.

Balance damper.--

Balance damper shall be butterfly type, 1.52 mm (16-gage) minimum galvanized steel blade, end bearings with steel shaft and locking and indicator operator. Balance damper shall be Ventlock, Young, Anemostat, or equal.

Product data.--Manufacturer's descriptive data and installation instructions shall be submitted for approval.

Barometric Relief Damper.--

Barometric Relief Damper shall be pre-assembly by manufacture not fabricated on site. Constructed of 1.6 mm gauge galvanized steel frame, formed aluminum blades, with polyfoam blade edging, adjustable counterweights, and closing spring. Barometric pressure damper shall be a horizontally mountable type, close when economizer is off and fully open when economizer is on, low leak type. The damper shall be provided with a face screen shall be perforated heavy gauge steel have 5.0 mm holes on 6.5 mm staggered center.

Motorized Damper.--

Motorized damper shall be a two position actuator, power open and spring return to close, 100% closed on heating and 100% open on cooling or economizer, low leak round damper. Motorized damper shall be Jackson System, D-Z1-08; Greenheck, VCDR-53; FAMCO, ADC-8; or equal.

Exhaust Fan Thermostat.--

Exhaust fan thermostat shall be 120 voltage type, single set point range internally adjustable from 4 Deg. C to 27 Deg. C, and provided with a blank cover.

Air filter (for HVAC units).--

Air filter shall be permanent metal viscous impingement type, constructed of aluminum or galvanized steel, 50 mm minimum thickness and be approved for Class 2 use. Filter shall have a minimum efficiency rating of 50 percent as determined when tested in accordance with ASHRAE Test Standard 52. Filter shall be mounted in 1.52 mm (16-gage) galvanized steel holding frames. Two cans of recharging adhesive shall be provided with the filter and shall be nearly odorless, have a high flash point, rapid wetting characteristics, dye tracer and be water soluble. Filter shall be Airspan, Type AF, Eco-Air Products, Inc., Type HIA; Snyder General, Type AAF; or approved equal.

Vents and flues (for heaters).--

Vents and flues for heaters shall be approved Type B or approved plastic vents for condensing furnaces.

Refrigerant and condensate drain piping.--

Refrigerant and condensate drain piping shall be rigid, Type L copper tubing with brazed solder fittings. The suction line shall be insulated, with vapor barrier and shall be weatherproofed for exterior installation. Factory sealed tubing shall not be used.

PART 3.- EXECUTION

INSTALLATION.--

Heaters.--Unit heaters, shall be installed in such a manner as to insure adequate furnace clearance and separation of combustion air and circulating air. Appliances shall be connected to a rigidly mounted gas pipe supply system by an AGA approved flex connector and gas valve.

Ventilators--Exhaust ducts connected to exhaust fans shall be routed as shown on the plans and shall terminate in a weatherproof cap. Duct sizes shall be as shown on the plans or as recommended by the manufacturer, whichever is larger. Roof fans shall be curb mounted.

Condensate drains.--Air conditioning units and heat pumps shall be provided with condensate drain trap and piping. Outdoor piping shall extend to the nearest roof drain, gutter or as shown on the plans. Air gap shall be installed where required by code. Interior condensate drain piping shall be insulated with foam insulation.

Evaporative cooler.--Roof mounted evaporative cooler shall be provided with drain piping routed to the nearest roof drain or gutter. Air gap shall be installed where required by code.

Mounting heights.--Thermostats and time switches shall be installed as shown on the plans.

Temperature control for each unit heater shall be provided by a thermostat and time switch. Thermostat shall be set for 21°C. The thermostat shall be wired in series with the time switch and shall de-energize the heater above the setpoint.

Each thermostat shall be insulated from the outside walls, and shall be provided with an aluminum radiation shield above the thermostat.

The time switch shall be installed beside the thermostat or where shown on the plans.

Air outlets.--Volume dampers shall be furnished and installed for all diffusers. Blocking shall be provided on all sides of air outlets between ceiling or wall joists. Collars shall be supplied for all outlets and shall be taped and sealed in place.

Vents and flues.--Vents and flues shall be securely fastened to the building construction, shall be provided with a collar at all ceiling penetrations and shall terminate with a weather cap fabricated of the same material.

Access door.--Access doors shall be provided in rigid ducts and plenums for access to volume dampers, fire dampers and control devices located within such ductwork; and shall be provided at such other locations as shown on the plans.

Ducts and vents.--Ductwork within the building shall be installed to clear lighting fixtures, doors, windows and other obstructions. Ductwork shall preserve head room and shall keep openings and passageways clear whether shown on plans or not.

Ductwork shall be installed and braced according to the latest edition of the SMACNA "HVAC Duct Construction Standards."

Slopes in sides at transitions shall be approximately one to five. The ductwork system shall not contain abrupt changes or offsets of any kind unless otherwise shown on the plans.

Where ducts pass through walls, floors or ceilings, galvanized sheet metal or steel angle collars shall be installed around the ducts.

Duct sections shall be connected by beaded sleeve-type couplings using joint sealer as recommended by the duct manufacturer. Duct sections shall be mechanically fastened with pop rivets or sheet metal screws and sealed with mastic or insulated, reinforced silver tape.

Flexible connections shall be provided at both inlet and outlet of fan coil and ventilating units.

Sheet metal plenums shall be adequately braced and supported from the floor or structure with structural steel angles to prevent sagging, flexing and vibration.

All standing seams and transverse joints of supply, return and exhaust ducts and seams around plenums, fan and coil housings shall be sealed with sealant and taped.

Ductwork identification.--Ductwork shall be identified as follows:

Duct Description	Identification Symbol
Supply duct	S
Return duct	R
Exhaust duct	EXH
Outside air duct	OA

Identification symbol letters shall be stenciled at locations visible from the access routes to be used by maintenance workers. Such letters shall be painted with black colored paint and shall be a minimum of 50 mm high.

FIELD QUALITY CONTROL.--

Pre-test requirements.--Before starting or operating systems, equipment shall be cleaned and checked for proper installation, lubrication and servicing.

In each system, at least one air path, from fan to final outlet, shall have all balance dampers open. The final air quantities shall be achieved by adjusting the volume dampers or the fan RPM.

Final adjustments and balancing of the systems shall be performed in such a manner that the systems will operate as specified and as shown on the plans.

The Contractor shall replace or revise any equipment, systems or work found deficient during tests.

All automatic operating devices which are pertinent to the adjustment of the aforementioned air systems shall be set and adjusted to deliver the required quantities of air and at temperatures specified by the Engineer. All control work shall be done in collaboration with the control manufacturer's representative.

Project completion tests.--The Engineer shall be notified at least 3 working days in advance of starting project completion tests.

The project completion tests shall consist of the following:

1. **Air Systems.**--All air systems shall be tested and balanced to the conditions set forth on the plans and in these special provisions. This work shall be performed by an Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certified contractor. The air systems include, but are not necessarily limited to, the following:
 - a. Supply air systems
 - b. Return air systems
 - c. Exhaust air systems
2. **Operational Data.**--The tests shall include operation of the heating, cooling, and ventilating systems for not less than two 8-hour days, each system shall operate at not less than 90 percent of their full specified capacities.

The required data shall be accurately measured. The data shall be measured during one operational cycle in the presence of the Engineer and shall be submitted for approval.

The following data shall be measured and tabulated:

- a. Ambient temperatures and conditions, °C
- b. Supply and return air quantities, L/sec, each room
- c. Thermostat set point, °C
- d. Air temperatures at room center, °C
- e. Fan motor amperages and voltages
- f. System static pressures, Pa

SECTION 12-16. ELECTRICAL

12-16.01 ELECTRICAL WORK

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of performing electrical work in accordance with the details shown on the plans and these special provisions.

Electrical work shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on the plans and the work of installing electrical connections for the thermostats, motors, and controls specified elsewhere in these special provisions.

System layouts are generally diagrammatic and location of equipment is approximate. Exact routing of conduits and other facilities and location of equipment is to be governed by structural conditions and other obstructions, and shall be coordinated with the work of other trades. Equipment requiring maintenance and inspection shall be located where it is readily accessible for the performance of such maintenance and inspection.

Related work.--Earthwork, foundations, sheet metal, painting, mechanical and such other work incidental to and necessary for the proper installation and operation of the electrical work shall be done in accordance with the requirements specified for similar work elsewhere in these special provisions.

CLOSEOUT SUBMITTALS.--

Operation and maintenance manuals.--Prior to the completion of the contract, 3 identified copies of the operation and maintenance instructions with parts lists for the equipment specified herein shall be delivered to the Engineer at the jobsite. The instructions and parts lists shall be in a bound manual form and shall be complete and adequate for the equipment installed. Inadequate or incomplete material will be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

Manuals shall be submitted for the following equipment:

Standby Generator

QUALITY ASSURANCE.--

Codes and standards.--All work performed and materials installed shall be in accordance with the National Electrical Code; the California Building Standards Code, Title 24, Part 3, "California Electrical Code," and the California Code of Regulations, Title 8, Chapter 4, "Electrical Safety Orders," and all state ordinances.

Warranties and guarantees.--Manufacturer's warranties and guarantees for materials or equipment used in the work shall be delivered to the Engineer at the jobsite prior to acceptance of the contract.

TESTING.--

After the electrical system installation work has been completed, the electrical system shall be tested in the presence of the Engineer to demonstrate that the electrical system functions properly. The Contractor shall make necessary repairs, replacements, adjustments and retests at his expense.

12-16.02 BASIC MATERIALS AND METHODS

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing conduits, conductors, fittings, and wiring devices in accordance with the details shown on the plans and these special provisions.

Conduits, conductors, fittings, and wiring devices shall include those accessories and appurtenances, not mentioned, that are required for the proper installation and operation of the electrical system.

Where conduits pass through fire rated wall, floor or ceiling assemblies, the penetrations shall be protected in accordance with the requirements specified under "Through-Penetration Firestopping" in Section 12-7, "Thermal and Moisture Protection," of these special provisions.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions for recessed junction and pull boxes, and component layout shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

CONDUITS AND FITTINGS.--

Rigid steel conduit and fittings.--

Rigid steel conduit shall be threaded, full weight rigid steel, hot-dip galvanized inside and outside with steel or malleable iron fittings. Fittings shall be threaded unless otherwise specified or shown on the plans.

Split or three-piece couplings shall be electroplated, malleable cast iron couplings.

Insulated grounding bushings shall be threaded malleable cast iron body with plastic insulated throat and steel, lay-in ground lug with compression screw.

Insulated metallic bushings shall be threaded malleable cast iron body with plastic insulated throat.

Electrical metallic tubing (EMT) and fittings.--

Electrical metallic tubing shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam with zinc coating outside and enamel or lacquer coating inside.

Couplings shall be electroplated, rain and concrete tight, gland compression type, steel body couplings with malleable iron nuts.

Connectors shall be electroplated, rain and concrete tight, gland compression type, steel body connectors with male hub, malleable iron nut and insulated plastic throat.

Flexible metallic conduit and fittings.--

Flexible metallic conduit shall be fabricated in continuous lengths from galvanized steel strip, spirally wound and formed to provide an interlocking design.

Fittings shall be electroplated screw-in type with malleable cast iron body and threaded male hub with insulated throat.

Liquid tight flexible metallic conduit and fittings.--

Liquid tight flexible metallic conduit shall be fabricated in continuous length from galvanized sheet steel, spirally wound and formed to provide an interlocking design with an extruded polyvinyl chloride cover.

Fittings shall be electroplated, malleable cast iron body, with cap nut, grounding ferrule, and connector body with insulated throat.

Rigid non-metallic conduit and fittings.--

Rigid non-metallic conduit shall be Schedule 40, high impact, nonconducting, self-extinguishing polyvinyl chloride (PVC) rigid non-metallic conduit for direct underground burial.

Couplings shall be PVC, socket type or thread on one end and socket type on the other end as required for the particular application.

Terminal adapters for adapting PVC conduit to boxes, threaded fittings, or metallic conduit system shall be PVC adapters with threads on one end and socket type on the other end.

CONDUCTORS.--**Conductors.--**

Conductors shall be stranded copper wire.

Conductor insulation types unless otherwise shown or specified, shall be as follows:

1. Conductors across hinges of control panel enclosures shall be Type MTW.
2. Conductors shall be type XHHW-2 in wet and outdoor locations.
3. Conductors shall be type THHN in dry locations.

Wire connections and devices.--

Wire connections and devices shall be pressure or compression type, except that connectors for No. 10 AWG and smaller conductors in dry locations may be preinsulated spring-pressure type.

ELECTRICAL BOXES.--**Outlet, device and junction boxes.--**

Unless otherwise shown or specified, boxes shall be galvanized steel boxes with knock-outs and shall be the size and configuration best suited to the application indicated on the plans. Minimum size of outlet, receptacle, switch or junction boxes shall be 100 mm square by 40 mm deep, except that switch boxes for the installation of single switches and outlet boxes for flush-mounted light fixtures shall be 50 mm by 75 mm by 40 mm deep.

Multiple switches shall be installed in standard gang boxes, unless otherwise specified or shown on the plans.

Cast metal boxes shall be cast iron boxes with threaded hubs and shall be of the size and configuration best suited to the application shown on the plans.

Flush-mounted boxes shall have stainless steel covers, one mm thick. Cover screws shall be metal with finish to match cover finish.

Unless otherwise shown or specified, surface-mounted boxes shall have galvanized steel covers with metal screws.

Weatherproof junction boxes shall have cast metal covers with gaskets.

Weatherproof switch and receptacle boxes shall have gasketed covers with gasketed hinged flaps to cover switches and receptacles.

Sectional device plates will not be permitted.

Underground pull boxes.--

Pull boxes shall be high density reinforced concrete box with ultraviolet inhibitor polyethylene etched face anchored in concrete and fiberglass cover with hold down bolts. The polyethylene and fiberglass material shall be fire resistant and show no appreciable change in physical properties with exposure to the weather. No. 5 pull box shall be Brooks Products No. 5; Christy Concrete Products, N30; or equal. No.6 pull box shall be Brooks Products No. 6; Christy Concrete Products No.36 or equal.

Traffic rated pull boxes shall be high density reinforced concrete box with steel cover with hold down bolts and bonding strap. Pull box and cover shall be designed for H20 loading. No. 5 pull box shall have inside dimensions of 335 mm by 610 mm. No. 6 pull box shall have inside dimensions of 430mm by 760mm.

RECEPTACLES AND SWITCHES.--**Ground fault circuit interrupter receptacles, (GFCI).--**

Ground fault circuit interrupter receptacles shall be NEMA Type 5-20R, feed-through type, ivory color, 3-wire, 20-ampere, 125-volt AC, grounding type, specification grade, duplex receptacle with ground fault interruption. Receptacle shall detect and trip at current leakage of 5 milliamperes and shall have front mounted test and reset buttons.

Duplex receptacles.—

Duplex receptacles shall be NEMA Type 5-20R, 3-wire, 20-ampere, 125-volt AC, safety grounding, ivory color, specification grade receptacle suitable for wiring with stranded conductors. Duplex receptacles identified as "MIS" shall be isolated Ground type, orange color, specification grade duplex receptacles.

Reel light receptacles.--

Reel light receptacles shall be 3-wire, 15-ampere, 125-volt AC, twist-lock, grounding type, single, specification grade receptacle suitable for wiring with stranded conductors.

Multi-outlet assemblies.--

Multi-outlet assemblies shall be 3-wire, 15-ampere, 125-volt AC, 1829mm long strip, grounding type receptacles spaced 305mm on center. The assembly shall be provided with the necessary entrance end fitting and blank end fitting.

Welding receptacles.—

Welding receptacles shall be surface-mounted, 600-volt, 60-ampere, 3-wire, 2-pole, circuit breaking, weather resistant, raintight receptacle with female interior assembly. The receptacle shall be complete with back box, angle adapter and spring door. The receptacle shall be grounded through extra pole and shell, and shall have crimp or solder type connections. A mating plug for the receptacle shall be provided.

Vehicle lift receptacles.—

Vehicle lift receptacles shall be surface-mounted, 600-volt, 60-ampere, 4-wire, 3-pole, circuit breaking, weather resistant, raintight receptacle with female interior assembly. The receptacle shall be complete with back box, angle adapter and spring door. The receptacle shall be grounded through extra pole and shell, and shall have crimp or solder type connections. A mating plug for the receptacle shall be provided.

Snap switches.--

Snap switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Motion sensor wall switches.--

Motion sensor wall switches shall be wall-mounted, 3-wire, 800-watt incandescent or fluorescent, off-auto-on, passive infrared sensor switch with adjustable photocell override and time delay and shall operate on 120/277 volts. The sensor switch shall cover a minimum of 84 square meters of floor area, be suitable for installation in a single gang box, and shall have a field of view of not less than 170 degrees. The time delay setting shall be adjustable from 30 seconds to 20 minutes, initially set at 5 minutes.

Three-way toggle switches.--

Three-way toggle switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

Four-way toggle switches.--

Four-way switches shall be 20-ampere, 120/277-volt AC, quiet type, specification grade, ivory color switch with silver cadmium alloy contacts. Switch shall be suitable for wiring with stranded conductors.

MISCELLANEOUS MATERIALS.--**Warning Tape.--**

Warning tape shall be 100 mm wide and contain the printed warning "CAUTION ELECTRICAL CONDUIT" in bold 19 mm black letters at 760 mm intervals on bright orange or yellow background. The printed warning shall be non-erasable when submerged under water and resistant to insects, acids, alkali, and other corrosive elements in the soil. The tape shall have a tensile strength of not less than 70 kg per 100 mm wide strip and shall have a minimum elongation of 700 percent before breaking.

Pull ropes.--

Pull ropes shall be nylon or polypropylene with a minimum tensile strength of 225 kg.

Watertight conduit plugs.--

Watertight conduit plugs shall be a hollow or solid stem expansion plugs complete with inner and outer white polypropylene compression plates and red thermoplastic rubber seal. Seal material shall be non-stick type rubber resistant to oils, salt, and alkaline substances normally available at the construction sites.

Anchorage devices.--

Anchorage devices shall be corrosion resistant, toggle bolts, wood screws, bolts, machine screws, studs, expansion shields, and expansion anchors and inserts.

Electrical supporting devices.--

Electrical supporting devices shall be one hole conduit clamps with clamp backs, hot-dipped galvanized, malleable cast iron.

Construction channel shall be 41 mm x 41 mm, 2.66 mm (12-gage) galvanized steel channel with 13 mm diameter bolt holes, 40 mm on center in the base of the channel.

Ground rod(s).--

Ground rod(s) shall be a 19 mm (minimum) galvanized or copper clad steel rod, 3 meters long.

Telephone/data outlet boxes.--

Telephone/data outlet boxes shall be 102 mm square boxes and plates with modular type telephone and data outlet. Boxes on stud walls shall have plaster ring.

Plates for flush mounting outlets in finished room shall be Type 430 stainless steel, one mm thick with satin finish.

Speaker junction box .--

Speaker junction box shall be 102 mm square boxes with blank cover plates for future speaker installation by others. Boxes on stud walls shall have plaster ring.

Radio system terminal cabinet .--

Radio system terminal cabinet shall be flush mounted, NEMA 1, galvanized steel, gray polyester powder finish, with continuous hinged door, flush-locking latch, and wood mounting panel inside. Size as indicated on the plans.

Telephone system terminal cabinet (at Service Bays).--

Telephone system terminal cabinet shall be surface mounted, NEMA 1, galvanized steel, gray polyester powder finish, with continuous hinged door, flush-locking latch, and wood mounting panel inside. Cabinet shall be 455 x 305 x 152 mm.

PART 3.- EXECUTION

INSTALLATION.--

Conduit, general.--Rigid steel conduit shall be used unless otherwise shown on the plans or specified in these special provisions.

Electrical metallic tubing may be used in furred spaces and for exposed work indoors above the switch height.

Unless otherwise specified or shown on the plans, flexible metal conduit shall be used to connect suspended lighting fixtures, motors, HVAC equipment, and other equipment subject to vibration in dry locations.

Unless otherwise specified or shown on the plans, liquid-tight flexible metal conduit shall be used to connect motors, HVAC equipment, and other equipment subject to vibration in wet locations.

Rigid non-metallic conduit shall be used at the locations shown on the plans for direct underground burial outside the building foundation.

Conduit installation.--Conduit trade sizes are shown on the plans. No deviation from the conduit size shown on the plans will be permitted without written permission from the Engineer.

Conduit shall be concealed unless otherwise shown on the plans.

Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.

Rigid non-metallic conduit bends of 30 degrees or greater shall be factory-made long radius sweeps. Bends less than 30 degrees shall be made using an approved heat box.

A pull rope shall be installed in all empty conduits. At least one meter of pull rope shall be doubled back into the conduit at each termination.

Locations of conduit runs shall be planned in advance of the installation and coordinated with the ductwork, plumbing, ceiling and wall construction in the same areas and shall not unnecessarily cross other conduits or pipe, nor prevent removal of ceiling tiles or panels, nor block access to mechanical or electrical equipment.

Where practical, conduits shall be installed in groups in parallel, vertical or horizontal runs and at elevations that avoid unnecessary offsets.

Exposed conduit shall be installed parallel and at right angles to the building lines.

Conduits shall not be placed closer than 300 mm from a parallel hot water or steam pipe or 75 mm from such lines crossing perpendicular to the runs.

All raceway systems shall be secured to the building structures using specified fasteners, clamps and hangers.

Single conduit runs shall be supported by using one hole pipe clamps. Where run horizontally on walls in damp or wet locations, conduit shall be installed with "clamp backs" to space conduit off the surface.

Multiple conduit runs shall be supported with construction channel secured to the building structure. Conduits shall be fastened to construction channel with channel compatible pipe clamps.

Raceways of different types shall be joined using approved couplings or transition fittings.

Expansion couplings shall be installed where conduit crosses a building separation or expansion joint.

All floor and wall penetrations shall be sealed water-tight.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel or cylindrical wire brush and blown out with compressed air.

Conduit terminations.--Rigid steel conduits shall be securely fastened to cabinets, boxes and gutters using 2 locknuts and specified insulating metallic bushing. Electrical metallic tubing shall be securely fastened to cabinets, boxes and gutters using specified connectors. Conduit terminations at exposed weatherproof enclosures and cast outlet boxes shall be made watertight using specified hubs.

Grounding bushings with bonding jumpers shall be installed on all type of conduits terminating at concentric knockouts and on all conduits containing service conductors, grounding electrode conductor, and conductors feeding separate buildings.

Rigid non-metallic conduits shall be terminated inside the underground pull boxes with an approved conduit bushings or fittings. All conduits shall enter the pull box at an angle of 45 degrees or more.

All future conduits terminated in underground pull boxes or exposed indoor and outdoor shall be provided with watertight conduit plugs.

Warning Tape.--Warning tape shall be placed over each conduit in a trench. Each warning tape shall be centered over the conduit and shall be placed over the 150 mm layer of sand covering the conduit as described elsewhere in these special provisions.

Conductor installation.--Conductors shall not be installed in conduit until all work of any nature that may cause injury is completed. Care shall be taken in pulling conductors that insulation is not damaged. An approved non-petroleum base and insulating type pulling compound shall be used as needed.

Splices and joints shall be insulated with insulation equivalent to that of the conductor.

Provide 155 mm of slack at each outlet and device connection. If the outlet or device is not at the end of a run of wire, connection shall be made with correctly colored pigtails tapped to the runs with splices as specified herein.

Branch circuit conductors in panelboards and load centers shall be neatly trained along a path from the breaker terminals to their exit point. The conductors shall have ample length to transverse the path without strain, but shall not be so long as to require coiling, doubling back, or cramming. The path shall transverse the panelboard gutter spaces without entering a gutter containing service conductors and, unless otherwise shown on the plans, without entering the gutter space of any panelboard feeder.

All pressure type connectors and lugs shall be retightened after the initial set.

Splices in underground pull boxes and similar locations shall be made watertight.

Junction boxes in furred or accessible ceiling spaces shall be identified with felt-tip pen denoting the circuits contained in the box.

Conductor identification.--The neutral and equipment grounding conductors shall be identified as follows:

Neutral conductor shall have a white or natural gray insulation except that conductors No. 4 and larger may be identified by distinctive white marker such as paint or white tape at each termination.

Equipment grounding conductor shall be bare or insulated. If insulated, equipment grounding conductors shall have green or green with one or more yellow stripes insulation over its entire length except that conductors No. 4 and larger may be permanently identified by distinctive green markers such as paint or green tape over its entire exposed insulation.

Ungrounded feeder and branch circuit conductors shall be color coded by continuously colored insulation, except conductors No. 6 AWG or larger may be color coded by colored tape at each connection and where accessible. Ungrounded conductor color coding shall be as follows:

SYSTEM	COLOR CODE
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120/208V-Three phase	Black, red, blue
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Once an insulated circuit conductor, including grounded and ungrounded conductors, is identified with a specific color code, that color code shall be used for the entire length of the circuit.

Where more than one branch circuit enters or leaves a conduit, panel, gutter, or junction box, each conductor shall be identified by its panelboard and circuit number. All control conductors including control conductors of manufacturer supplied and field wired control devices shall be identified at each termination with the wire numbers shown on the plans, approved working drawings, and as directed by the Engineer where deemed necessary. Identification shall be made with one of the following:

1. Adhesive backed paper or cloth wrap-around markers with clear, heat shrinkable tubing sealed over either type of marker.
2. Self-laminating wrap around type, printable, transparent, permanent heat bonding type thermoplastic film markers.
3. Pre-printed, white, heat-shrinkable tubing.

Each terminal block shall have a molded marking strip attached with screws. The identifying numbers of the terminating conductors, as shown on the plans or on the submittal drawings, shall be engraved in the marking strip.

Outlet, device and junction box installation.--Where exposed threaded steel conduits are connected to an outlet, device, or junction box below switch height, the box shall be a cast metal box. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall be sheet steel boxes. Weatherproof outlet, device and junction boxes shall have cast metal covers with gaskets. Unless otherwise shown on the plans or specified in these special provisions, all other boxes shall have standard galvanized covers.

All boxes shall finish flush with building walls, ceiling and floors except where exposed work is called for.

Raised device covers (plaster rings) shall be installed on all boxes concealed in concrete, masonry or stud walls.

No unused openings shall be left in any box. Knockout seals shall be installed as required to close openings.

Outlet, device, and junction boxes shall be installed at the locations and elevations shown on the plans or specified herein. Adjustments to locations may be made as required by structural conditions and to suit coordination requirements of other trades.

Boxes in stud walls and partitions shall not be mounted back to back. Through-wall boxes shall not be used.

Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on heavy gauge galvanized steel, snap-in box supports.

Fixture outlet boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted on 1.52 mm (16-gage) metal channel bars attached to main ceiling runners.

Fixture outlet boxes for pendant-mounted fixtures installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structures above.

Underground pull box installation.--Electrical pull box covers or lids shall be marked "ELECTRICAL." Telephone service pull box covers or lids shall have plain, unmarked covers.

The bottom of pull boxes shall be bedded in 155 mm of clean, crushed rock or gravel and shall be grouted with 40 mm thick grout prior to installation of conductors. Grout shall be sloped to a 25 mm PVC pipe drain hole. Conduit shall be sealed in place with grout.

Top of pull boxes shall be flush with surrounding grade or top of curb. In unpaved areas where pull box is not immediately adjacent to and protected by a concrete foundation, pole or other protective construction, the top of pull box shall be set at plus 30 mm above surrounding grade. Pull boxes shown on the plans in the vicinity of curbs shall be placed adjacent to the back of curb. Pull boxes shown on the plans adjacent to lighting standards shall be placed on the side of foundation facing away from traffic.

Ground rod(s) installation.--The ground rod(s) shall be driven vertically until the top is 155 mm above the surrounding surface. When vertical penetration of the ground rod cannot be obtained, an equivalent horizontal grounding system, approved by the Engineer, shall be installed.

Anchorages.--Hangers, brackets, conduit straps, supports, and electrical equipment shall be rigidly and securely fastened to surfaces by means of toggle bolts on hollow masonry; expansion shields and machine screws, or expansion anchors and studs or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood or lag screws on wood construction.

Anchorage devices shall be installed in accordance with the anchorage manufacturer's recommendations.

Mounting heights.--Electrical system components shall be mounted at the following mounting heights, unless otherwise shown on the plans. The mounting height dimensions shall be measured above the finished floor to the bottom of the device or component.

Thermostats	1.1 m office areas 1.25 m , hallways
Wall switches	1.0 m
Convenience outlets	510 mm , office areas 1.25 m , all other areas
Electric water cooler outlet	As recommended by the water cooler manufacturer.
Telephone outlets	510 mm

12-16.03 SERVICE AND DISTRIBUTION

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing service and distribution equipment in accordance with the requirements of the serving utilities, the details shown on the plans and these special provisions.

Attention is directed to "Utility Connection" in Section 12-1, "General Requirements," of these special provisions regarding arrangements, permits, licenses, charges, fees and costs for utility connections and extensions.

Related work.--Concrete and reinforcement for service pedestal shall conform to the requirements specified for minor work under "Cast-in-Place Concrete," in Section 12-3, "Concrete and Reinforcement," of these special provisions.

SUBMITTALS.--

Installation details.--The Contractor shall submit complete service installation details to the serving utilities for approval. Prior to submitting installation details to the serving utility, the Contractor shall have said drawings reviewed and stamped "APPROVED" by the Engineer. Submittals shall be approved by the serving utility prior to commencing work.

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

Main service switchboard .--

Main service switchboard shall contain a pull section, metering compartment and service disconnect switch for 208/120-volt, 600-ampere, 3-phase, 4-wire service. Main Service Switchboard shall also contain the Main Distribution Panel, Power Transfer Switch, and Standby Distribution Panel as shown on the plans. Interruptive capacity of circuit breakers shall be minimum 42,000 amperes (symmetrical) at 240 volts.

Enclosure.--

Enclosure shall be NEMA 3R enclosure. Exterior shall be 2.66 mm (12-gage) and interior shall be 1.90 mm (14-gage) sheet steel. All screws, latches, hinge pins and similar hardware shall be stainless steel. Circuit breaker shall be operable with the exterior door open. Exterior door shall be lockable with a padlock. Enclosure finish shall be baked enamel or baked thermosetting polyester finish.

Service disconnect switch.--

Service disconnect switch shall be 3-pole, 240-volt, 600-ampere frame, 600-ampere trip, molded case circuit breaker with AC magnetic trip adjusted to 2000-amperes. The interrupting capacity of the circuit breaker shall be 42,000 amperes (symmetrical) at 240-volt.

Power Transfer Switch.—

Power Transfer Switch shall be two molded case switches, rated 3-pole, 240-volt, 400-ampere each, manually operated and mechanically interlocked so neither switch can be closed before the other switch is opened.

Concrete.--

Concrete for service pedestal shall be commercial quality concrete, proportioned to provide a workable mix for the intended use; shall contain not less than 285 kilograms of cement per cubic meter.

PART 3.- EXECUTION

Foundation for main service switchboard shall be as shown on the plans.

Installation of service and distribution equipment shall be in accordance with the requirements of the serving utilities.

12-16.04 ELECTRICAL EQUIPMENT

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing panelboards, starters, disconnect switches, transformers, and related accessories in accordance with the details shown on the plans and these special provisions.

Related work.--Anchorage devices shall be as specified under "Basic Materials and Methods" elsewhere in this Section 12-16.

SUBMITTALS.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Control and wiring diagrams, rough-in dimensions, and component layout shall be included where applicable. All control and power conductors on the working drawings shall be identified with wire numbers.

PART 2.- PRODUCTS

PANELBOARDS.--

Panelboards A, EA, S, ES, Q, EQ.--

Panelboards A, EA, S, ES, Q, EQ shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 240/120-volt, AC panelboard at least 508 mm wide with 225-ampere frame main circuit breaker, ampere trip as shown on the plans, electrolytically tin plated copper bus bars, insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Panel shall be Square D Company, NQOD; General Electric, AQ; or equal.

Panelboards B, EB.--

Panelboards B, EB shall be indoor type, surface-mounted, factory assembled, 3-phase, 4-wire, 240/120-volt, AC panelboard at least 508 mm wide with 100-ampere main circuit breaker, electrolytically tin plated copper bus bars r insulated groundable neutral, hinged door and molded case branch circuit breakers as shown on the plans. Panels shall be Square D Company, NQOD; General Electric, AQ; or equal.

STARTERS.--

Air compressor starter.--

Air compressor starter shall be combination 3-pole, 208-volt, NEMA Size 1, NEMA rated, line voltage starter and motor circuit protector in a NEMA-1 enclosure. Air compressor starter shall have two, 2-ampere, dual element, 250-volt fuses with 2-pole barrier type fuse base; 240-volt coil, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Control switch and reset button shall be externally operable.

Evaporative cooler controller.--

Evaporative cooler controller shall be combination 3-pole, 208-volt, NEMA Size 0, NEMA rated, line voltage starter and motor circuit protector in a NEMA-1 enclosure. Motor starter shall have external control switch as indicated on the plans, double-break silver contacts and 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer. Start-stop and reset button shall be externally operable.

Declassification fan motor controller .--

Declassification fan controller shall have a NEMA 1 surface mounted enclosure with a hinged door and complete with main disconnect, fan starters (ST1 and ST2) and terminal blocks mounted inside the enclosure. The "Start-Stop" pushbuttons shall be externally operable. Declassification fan motor starters be 3-pole, 240-volt, NEMA rated line voltage starters, 120-volt coil with one auxiliary contact complete with 3 manual reset, non-adjustable thermal overloads, set to trip between 115 and 125 percent of full load motor current, as quoted on the nameplate by the motor manufacturer.

Fume exhaust fan motor manual motor starter.--

Fume exhaust fan manual motor starter shall be integral horse power rated, 3-pole, 240-volt, NEMA size __, with overload protection and "ON" and "OFF" pushbutton external disconnect, fan starters (ST1, ST2 and ST3) and terminal blocks mounted inside the enclosure. The "Start-Stop" pushbuttons shall be externally operable. Declassification fan motor starters be 3-pole, 240-volt, NEMA rated line voltage starters, 120-volt coil with one auxiliary contact.

SWITCHES.--**Air conditioner disconnect switch.--**

Air Conditioner Disconnect switch shall be 3-pole, 240-volt, AC, 60-ampere, fused, general duty safety switch in a NEMA-3R enclosure. The fuses shall be sized to suit the air conditioning unit furnished.

Evaporative cooler disconnect switch.--

Evaporative cooler disconnect switch shall be 3-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-3R enclosure with provision for padlocking in the "OFF" position.

Door operator disconnect switch.--

Door operator disconnect switch shall be 3-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

Crane disconnect switch.--

Crane disconnect switch shall be 3-pole, 240-volt, AC, 60-ampere, non-fusible, general duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

Vehicle exhaust reel disconnect switch.--

Vehicle exhaust reel disconnect switch shall be 3-pole, 240-volt, AC, 30-ampere, non-fusible, general duty safety switch in a NEMA-1 enclosure with provision for padlocking in the "OFF" position.

MISCELLANEOUS MATERIALS.--**Exhaust fan (declassification) warning sign.--**

Exhaust fan (declassification) warning sign shall be sheet steel, not less than 1.2 mm thick (18-gage) with a baked enamel coating and shall have red letters, 50 mm in height, on a white background. The inscription shall be as shown on the plans.

Nameplates.--

Nameplates shall be laminated phenolic plastic with white core and black front and back. Nameplate inscription shall be in capitals letters etched through the outer layer of the nameplate material.

Warning plates.--

Warning plates shall be laminated phenolic plastic with white core and red front and back. Warning plates inscription shall be in capitals letters etched through the outer layer of the nameplate material.

Plywood backing board.--

Plywood backing board for mounting electrical or telephone equipment shall be 19 mm, APA plywood panels, C-D PLUGGED and touch-sanded, Exposure 1. Telephone Terminal Board and Radio Terminal Board shall be 1220 mm wide by 2440 mm high.

PART 3.- EXECUTION**INSTALLATION.--**

Plywood backing board.--Plywood backing board shall be securely fastened to walls or other vertical framing.

Surface to be coated shall be cleaned of all dirt, excess materials, of filler by hand cleaning.

Plywood backing board exposed surfaces shall receive the following paint system: one prime coat, alkyd, interior wood primer and 2 finish coats, acrylic, interior enamel, semi-gloss. Color shall match surrounding surfaces, or shall be as directed by the Engineer.

Coatings shall be applied in accordance with the manufacturer's instructions. Each coat shall be applied to a uniform finish, free of skips, brush marks, laps or other imperfections.

Panelboard installation.--Set cabinets plumb and symmetrical with building lines. Train interior wiring as specified under "Conductor and Cable Installation" in "Basic Materials and Methods" of these special provisions. Touch-up paint any marks, blemishes, or other finish damage suffered during installation. Replace cabinets, doors or trim exhibiting dents, bends, warps or poor fit which may impede ready access, security or integrity.

Mounting height shall be 1.67 meters to the highest circuit breaker handle, measured above the finished floor.

Where "Future" or "Space" is indicated on the plans, branch connectors, mounting brackets, and other hardware shall be furnished and installed for future breaker.

A typewritten directory under transparent protective cover shall be provided and set in metal frame inside each cabinet door. Directory panel designation for each circuit breaker shall include complete information concerning equipment controlled, including room number or area designated on the plans.

Equipment identification.--Equipment shall be identified with nameplates fastened with self-tapping, cadmium-plated screws or nickel-plated bolts.

Nameplate inscriptions shall read as follows:

Item	Letter height, mm	Inscription
Panel A	6	PANEL A 208/120V, 3PH ,4W
Panel EA	6	PANEL EA 208/120V, 3PH ,4W
Panel B	6	PANEL B 208/120V, 3PH ,4W
Panel EB	6	PANEL EB 208/120V, 3PH ,4W
Panel S	6	PANEL S 208/120V, 3PH ,4W
Panel ES	6	PANEL ES 208/120V, 3PH ,4W
Panel Q	6	PANEL Q 208/120V, 3PH ,4W
Panel EQ	6	PANEL EQ 208/120V, 3PH ,4W

Light Reel Switch	3	LIGHT REEL
Air Compressor Starter	6	AIR COMPRESSOR
Lift Receptacle	6	VEHICLE LIFT
Declassification Fans Controllers	3	DECLASSIFICATION FANS
Outside Lighting Control Stations	6	OUTSIDE LIGHTS
Overhead Door Disconnect Switch	6	DOOR OPERATOR
Welder Receptacle	3	WELDER
Crane Disconnect Switch	?	CRANE
Declassificaiton Fan Pushbutton	3	DECLASSIFICATION FANS
Evaporative Cooler Controller	6	EVAPORATIVE COOLER
Fume Exhaust Fan manual motor starter	6	FUME EXHAUST FAN
Radio system terminal cabinet	3	RADIO
Telephone terminal cabinet	6	TELEPHONE TERMINAL CABINET
Telephone terminal board	6	TELEPHONE TERMINAL BOARD
Radio terminal board	6	RADIO TERMINAL BOARD

Warning plates.--Warning plates shall be attached to designated equipment with self-tapping cadmium-plated screws or nickel-plated bolts.

Warning plate inscriptions shall read as indicated on the plans.

12-16.05 LIGHTING

GENERAL.--This work shall consist of furnishing, installing and connecting all lighting equipment in accordance with the details shown on the plans and these special provisions.

SUBMITTALS.--Manufacturer's descriptive information, photometric curves, catalog cuts, and installation instructions shall be submitted for approval. Any other data as requested by the Engineer shall also be submitted for approval.

PRODUCTS.--

Lighting fixture lamps.--

Lighting fixture lamps shall be type and size as shown on the plans. Lamps shall be General Electric, Phillips, Sylvania, or equal. Fluorescent lamps, unless otherwise noted, shall be 4100K tri-phosphor with a CRI of 70 or greater.

Ballasts.--

All fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by the fixture. Fluorescent ballasts shall be UL Listed, Class P and ETL Certified ballasts with sound rating A. Fluorescent ballasts shall be high-frequency electronic ballasts with power factor greater than 0.95, nominal ballast factor of 0.88 unless specified otherwise, total harmonic distortion less than 20 percent, crest factor less than or equal to 1.7, complying with ANSI C 62.41 Category A for surge protection, and FCC Part 18 for interference.

Lighting fixtures.--

Lighting fixtures shall be as shown on the plans and as specified herein. Outdoor luminaires shall be listed and labeled "Fixture Suitable For Wet Locations."

F1.--

Lay-in 600 mm x 1200 mm lensed troffer fluorescent fixture with two 32-watt T8 lamps, electronic ballast. The fixture shall be Lithonia Series SP; Day-Brite, Series DG; or equal.

F2.--

Ceiling or stem mounted fluorescent fixture with two 32-watt T8 lamps, electronic ballast and one-piece, clear acrylic, wrap-around diffuser. The fixture shall be Lithonia, Series LB; Day Brite, SWN ; or equal.

F3.--

Stem or bracket mounted fluorescent fixture with two 59-watt T8 slimline lamps, electronic ballast and white baked enamel ribbed reflector, complete with end plates. The fixture shall be Lithonia, Series AF; Day Brite, 1F; or equal.

F4.--

Stem or bracket mounted fluorescent fixture with two 59-watt T8 slimline lamps, electronic ballast and white baked enamel ribbed reflector, complete with end plates. The fixture shall be Lithonia, Series AF; Day Brite, 1F; or equal.

F5.--

Ceiling-mounted fluorescent fixture with one 32-watt T8 lamps, electronic ballast and prismatic acrylic diffuser. The fixture shall be Lithonia, Series CB Day Brite, SJ; or equal.

F6.--

Ceiling-mounted fluorescent fixture with two 32-watt T8 lamps, electronic ballast and prismatic acrylic diffuser. The fixture shall be Lithonia, Series CB Day Brite, SJ; or equal.

F7.--

Recessed round fluorescent fixture, 228mm aperture, with prismatic lens and rated 26 watt, compact fluorescent lamps and integral ballast. Fixture shall be suitable for wet location. The fixture shall be Lithonia; Halo; or equal

F8.—

Recessed round fluorescent fixture, 228mm aperture, and rated 26 watt, open compact fluorescent lamps and integral ballast. Fixture shall be suitable for wet location. The fixture shall be Lithonia; Halo; or equal

F9.--

Surface mounted low profile round fluorescent fixture, with white acrylic diffuser, and rated 26 watt, compact fluorescent lamps and integral ballast. Fixture shall be suitable for wet location. The fixture shall be Lithonia; Halo; or equal

H1.--

Outdoor, wall mounted, 100-watt, high pressure sodium luminaire with integral ballast. Ballast voltage shall be 208-volt. The luminaire shall be Lithonia, Series TWH; Day-Brite, Series WLM; or equal.

H2.--

Outdoor, wall mounted, 70-watt, high pressure sodium luminaire with integral ballast. Ballast voltage shall be 208-volt. The luminaire shall be Lithonia, Series TWH; Day-Brite, Series WLM; or equal.

H3.--

Pole mounted, 250-watt, 208-volt, high pressure sodium, cutoff luminaire with integral ballast. IES distribution shall be Medium Cutoff Type III. The luminaire shall be Lithonia, Series CHL; Hubbell, Series RL; or equal.

MH1.—

Stem-mounted, 120-volt, 400-watt metal halide low bay luminaire with integral ballast. The luminaire shall have aluminum reflector and clear acrylic lens. Manufacturer shall be Day Brite, Lithonia, or equal.

Exit Signs.—

Exit signs shall have specification grade die cast aluminum housing, 120-volt input, with LED light source green exit and maintenance free sealed Nicad battery complete with trickle charge circuitry providing 90 minutes of emergency illumination. The exit signs shall come with mounting hardware for ceiling or wall applications.

Fused splices.--

Fused splices shall be Buss, Elastimold, or equal; with standard midget, ferrule, 2-ampere, 208-volt, slow blowing fuses.

Photoelectric cell, PEC.--

Photoelectric cell shall be cadmium sulfide photoelectric control with capacity of 1800-watt incandescent or 1000-watt inductive or fluorescent load, mounting adapter, and EEI-NEMA twist lock receptacle; Fisher-Pierce, Ripley, or equal.

Outside lighting control station, OLCS1, OLCS2.--

Outside lighting control station shall consist of a lighting contactors, selector switch, terminal block and pilot light in a surface mounted NEMA-12 enclosure with a hinged door.

Lighting contactor, LC.--

Lighting contactor shall be electrically held, 4-pole combination lighting contactor with 120-volt AC coil and 30-ampere, double-break, silver alloy contacts; Square D Company, I.T.E., Westinghouse, or equal.

Selector switch, SS.--

Selector switch shall be rotary action, double-pole, 3-position, 10-ampere, 120-volt switch. Switch contacts shall have an inductive pilot duty rating of 60 amperes (make), 6 amperes (break) and 10 amperes (continuous) at 120 volts and 35 percent power factor. Selector switch shall have legend plate marked MANUAL-OFF-AUTO.

Pilot light, PL.--

Pilot light shall be panel mounted, heavy duty, oil tight indicating light with 120-volt, AC, LED lamp with red domed cap.

Terminal block, TB.--

Terminal block shall be 30-ampere, 300-volt, molded plastic with two or more mounting holes and two or more terminals in each cast block. The molded plastic shall have a high resistance to heat, moisture, mechanical shock, and electrical potential and shall have a smooth even finish. Each block shall have a molded marking strip attached with screws. Terminal blocks shall have tubular, high pressure clamp connectors.

Concrete.--

Concrete shall be as specified under "Cast-In-Place Concrete" in Section 12-3, "Concrete and Reinforcement," of these special provisions. The concrete shall be commercial quality portland cement concrete containing not less than 337 kilograms of cement per cubic meter.

EXECUTION.--

LIGHTING FIXTURES.--Lighting fixtures shall be mounted securely in accordance with the manufacturer's recommendations. Mounting methods shall be suitable for the particular type of ceiling or support at each location.

The Contractor shall provide all supports, hangers, spacers, channels, fasteners and other hardware necessary to support the fixtures.

Fixtures shall be set at the mounting heights shown on the plans, except heights shown shall be adjusted to meet conditions.

BALLASTS.--All fluorescent fixtures shall be equipped with high power factor ballasts suitable for the line voltage and for the type, size and number of lamps required by fixture. The Contractor has the option to install low voltage dimming

control provided that the Contractor submit plans and specifications with appropriate revisions for the low voltage dimming control to the Engineers for approval prior to installation.

All ballasts used in unheated areas inside the building shall be -20°C ballasts or less.

POLE MOUNTED LUMINAIRES.--In the pull box adjacent to each pole for luminaire, H3, a fused splice connector shall be installed in each ungrounded conductor between the line and the ballast. The connector shall be readily accessible in the pull box and shall be insulated and made waterproof in accordance with the splice connector manufacturer's recommendations.

Concrete foundations shall be as shown on the plans. Anchor bolts or devices shall be accurately located and positioned to match the holes in the pole base plates. Pole and luminaire orientation shall be as indicated on the plans.

The poles for pole mounted type fixtures shall be mounted rigidly and securely on the foundations as recommended by the fixture and pole manufacturer.

12-16.06 STANDBY GENERATOR

GENERAL.--This work shall consist of furnishing and installing a standby generator in accordance with the details shown on the plans and these special provisions.

The standby generator shall include engine, generator, , circuit breakers, starting batteries, engine-generator control panel, battery charger, protective housing, top-mounted exhaust silencer, base mounted diesel fuel tank, drip pan, warning sign, battery hydrometer with storage container, battery filler, distilled water, anchoring devices, vibration isolators, and such other miscellaneous accessories, not mentioned, which are required for the complete installation and proper operation of the standby generator.

The standby generator assembly shall be factory assembled and mounted on a steel base with vibration isolators.

SUBMITTAL.--

Product data.--A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval.. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials and equipment specified herein. Engine and generator control schematic diagrams, interconnection diagrams, and exact dimension drawings of the engine-generator set shall be submitted for approval. All control and power conductors on the diagrams shall be identified with wire numbers.

PRODUCTS.--

Engine.--

The engine shall be 4-cycle natural gas fuel type with not less than 7500 cubic centimeters of piston displacement, liquid cooled, and designed for continuous operation. The gross engine output shall be 130 KW.

The engine's continuous duty rated output shall be ample to drive the generator and connected normal accessories at the rated speed and unity power factor at 100 percent of the rated load with an ambient temperature of 35°C at 100 meters above sea level.

The engine shall operate satisfactorily on natural gas fuel. The crankshaft shall be drilled for full pressure lubrication to all bearings. All crankshaft bearing surfaces shall be hardened. The crankshaft shall have one more main bearing than there are number of cylinders. The intake and exhaust valves and valve seats shall be heat resistant alloy steel. The exposed surfaces of the engine shall be finished with one coat of primer and 2 coats of an industrial paint suitable for the intended use.

The engine shall be equipped with the following accessories:

Fuel solenoid.—UL approved flexible fuel lines.

Oil Filter System.--The pressurized lubricating oil system shall have a full flow filter system, consisting of a strainer with openings not to exceed 0.64 mm in greatest dimension, and a separate, cleanable or replaceable filter capable of removing particles of 25 microns and larger. Filter shall be a spin on, replacable unit located for easy service access.

Air Filter System.--The air intake shall be provided with a dry type air filter of adequate capacity to effectively remove dirt and abrasives from the combustion air. The dry type filter shall be designed to allow for easy removal and replacement of filter element. The filter shall be equipped with service indicators to indicate necessary replacement.

Engine Governor.--Engine governor shall be of an electronic type.

Engine Cooling.--The engine shall be equipped with an engine driven radiator cooling system. The radiator shall be capable of cooling the engine while operating at 100 percent rated continuous load in 52°C maximum ambient temperature. Fan shall be push type.

Engine Preheater.--The engine shall be equipped with a 120-volt, 1000-watt electric water jacket heater. The heater shall be thermostatically controlled to maintain engine coolant at the proper temperature to meet the start up requirement of NFPA-99 standard. The required circuitry for proper operation shall be provided. The thermostat shall be adjustable between 35°C and 50°C.

Engine Starter.--The engine shall be provided with a 12-volt (negative ground) heavy duty positive engagement solenoid shift starting motor. The drive mechanism for engaging the starting motor with the engine flywheel shall engage and release without binding.

Safety Controls.--The engine shall be provided with automatic controls that shut down engine operation when low lubricating oil pressure, high water temperature or overspeed conditions occur. The values at which the low lubricating oil pressure, high jacket water temperature and overspeed controls operate to shut down engine operation, shall be as recommended by the engine manufacturer.

Overcrank safety controls shall be provided as specified in these special provisions.

Engine Instrumentation.--Engine instruments shall be mounted in the engine-generator control panel. Engine instruments shall include the following:

- a. Lubricating oil pressure gage.
- b. Water temperature gage.
- c. Engine hour meter (totalizing mechanism of 9,999 hours).

Exhaust system.--

The exhaust system shall consist of a silencer and flexible connection.

The silencer shall be a residential type, sized to meet or exceed the engine requirements. The muffler shall be provided with a drain, flange connection and companion flanges.

The flexible connection shall be bellows type, not less than 300 mm in length and installed between the engine exhaust and the Schedule 40 galvanized steel exhaust pipe. The flexible connection shall be constructed of Type 321 stainless steel and shall be provided with flanged ends for connection to the engine and galvanized steel exhaust pipe.

Starting batteries.--

Storage batteries for engine starting and other requirements shall be sufficient in number, and shall be 6-cell, heavy duty, lead-acid type. Total battery capacity shall be a minimum of 90 ampere-hours at the 20-hour rate. Batteries shall be mounted in corrosion resistant battery racks located within the skid base and shall be provided with battery cables of sufficient length to connect to the DC apparatus.

Battery charger.--

In addition to the integral battery charging circuit operable when the engine generator is running, an additional battery charger shall be of the dual rate type and shall be mounted in the engine-generator housing and operable with the input of 120-volt, when the generator is off. The battery charger shall be provided with the following features:

1. Dual fusing for AC input and DC output.
2. Automatic DC voltage regulation.
3. Automatic load regulation.
4. Compensation taps for setting the charger for average AC line and battery conditions.
5. DC cranking circuit disconnect relay.

Generator.--

The generator shall be a brushless type, single bearing, self-aligning, standby duty, synchronous type, with a drip-proof enclosure. The insulation shall be NEMA Class F or better.

The generator shall be rated at 100 KW, 125 KVA, 0.8 power factor, 208/120 volts, 3-phase, 4-wire, 60 Hz, and 1800 RPM. The generator shall have the following capabilities:

1. Steady state voltage regulation at full rated load shall be within plus or minus one percent.
2. Voltage regulation shall be within plus or minus 2 percent of rated steady state voltage from no load to full load.
3. Voltage recovery shall be within 2 percent of nominal rated voltage within 5 seconds, after the rated load is applied or removed in one-step.

Engine generator control panel.--

A completely wired and assembled engine-generator control panel shall be mounted on the engine-generator unit. The panel and its components shall comply with all applicable NEMA standards for industrial type controls, and shall be fully enclosed and vibration isolated. The panel shall include the following switches and instruments exposed on the front of the control panel:

1. AC ammeter.
2. AC voltmeter.
3. Three-position combination ammeter-voltmeter-phase selector switch.
4. Frequency meter.
5. Manual reset generator exciter circuit breaker with thermal magnetic trips.
6. Battery charger DC ammeter.
7. Manual "START-STOP" switch.
8. Indicating lights to show cause of emergency shutdown.
9. Emergency "STOP" switch.
10. Voltage adjust rheostat.
11. Engine oil pressure gage.
12. Engine running time meter.
13. Engine water temperature gage.

Equipment or devices to be mounted within the engine-generator control panel shall include the following:

1. Battery charger.
2. Automatic voltage regulator.
3. Automatic starting controls.
4. Radio interference suppression
5. Transformers, relays and other equipment required for proper operation.

Equipment mounted in the control panel shall be arranged for easy service access.

Miscellaneous accessories.--

A drip pan fabricated of not less than one mm thick (20-gage) galvanized sheet steel with turned up edges rolled over wire, sized to catch all oil or grease which may drop from the engine, shall be provided under the engine-generator set.

A galvanized sheet metal duct shall be fabricated and installed between the radiator and the exhaust louvers. This radiator cooling air exhaust duct shall be installed with vibration isolators.

The generator main power disconnect shall be 208-volt, 3-pole, 400-ampere trip molded case, thermal-magnetic, circuit breaker and shall be mounted in a NEMA Type-1 enclosure on the side of the generator housing. The

adjustable magnetic trip shall be set for 2000 amperes. The interrupting capacity of the circuit breaker shall be 42,000 amperes at 208 volts AC.

A commercial quality battery hydrometer with plastic type storage container, and a commercial quality 3.8 liter battery filler with filler hose and 3.8 liter of distilled water, shall be furnished and installed adjacent to the battery location. The body of the battery filler shall be clearly marked "DISTILLED WATER" in letters not less than 12 mm in height.

EXECUTION.--

The engine-generator set shall be installed on a concrete slab as shown on the plans.

Anchoring devices shall be as recommended by the engine-generator manufacturer and shall be installed to fasten the engine-generator set securely to the concrete slab.

Vibration isolators shall be installed between the engine base and the concrete slab. The type and size of the isolators shall be as recommended by the engine-generator manufacturer.

TESTING.--

The engine-generator power generating system, shall be tested at completion of installation and adjustments.

All necessary materials, test equipment and recording instruments, and labor required for the tests shall be furnished. The Contractor shall notify the Engineer not less than 5 working days in advance of testing. Testing shall be performed in the presence of the Engineer.

The engine-generator power generating system shall be tested for compliance with the conditions shown on the plans and the requirements specified in these special provisions.

Tests shall utilize a resistive load bank. All transient requirements shall be demonstrated by means of recording instruments. All engine safety shutdown devices shall be demonstrated.

A battery and starter test shall consist of 30 seconds of continuous cold with out engine start, followed by immediately by a normal engine start without excessive starter laboring.

A 4-hour heat run shall be conducted at 100 percent of generator rated full load capacity at the specified rated voltage.

12-16.07 INTRUSION ALARM SYSTEM

PART 1.- GENERAL

SUMMARY.--

Scope.--This work shall consist of furnishing and installing a complete and operational intrusion alarm system in accordance with the details shown on the plans and these special provisions.

The system shall include all materials, whether mentioned or not, that are necessary for a complete and operational intrusion alarm system.

SYSTEM DESCRIPTION.--

Design requirements.--The intrusion alarm system shall be a low voltage, direct current, zoned alarm system, and shall consist of a control panel, magnetic contact switches, combination detectors, multiple switch contact monitors, glass break discriminators, and manual keypad stations. Each zone shall be "supervised, Class B circuit." The end of line resistor shall be installed in the identified control panel.

The alarm system shall self-test and report status of individual zones every twenty-four (24) hours.

The alarm system shall provide an automatically rechargeable back-up power supply system, 24-hour minimum, in case of building power interruption.

The intrusion alarm reporting system components shall be U.L. Listed for commercial usage or F.M. Listed. The system proposed shall be approved by the Federal Communication Commission (FCC).

SUBMITTALS.--

Product data.--Manufacturer's descriptive information and installation instructions shall be submitted for approval.

Installation instructions shall include manufacturer and catalog reference, and model number of equipment to be furnished, conduit and conductor sizes, wiring diagram, and floor plan showing locations of multiple switch contact monitor and devices.

QUALITY ASSURANCE.--

Installer qualification.--The installer of the security alarm system shall be licensed by the State Department of Consumer Affairs, Bureau of Collection and Investigative Services. License numbers and expiration dates shall be included on all correspondence.

PART 2.- PRODUCTS

Control panel.--

The master control panel (Radionics 9412B) shall be a surface-mounted, locking cabinet, completely self-contained control panel suitable for 120-volt, AC, input power with separate terminals for all external wires.

The control panel shall meet the following requirements:

Control panel will be U.L Listed for Commercial fire and Burglar reporting;
Minimum eight (8) zones (capable of expansion);
Digital dialer communicator;
12-volt auxiliary power supply, rechargeable battery (24- hour minimum);
Battery charger;
Low battery reporting;
Silent alarm signaling;
System connected to RJ31X or RJ38X telephone jack or equivalent;
Line test every twenty-four (24) hours
120-volt, AC, input
Front accessible control and indication digital keypad;
U.L Listed for commercial use;
Remote control identification.

Magnetic contact switch.--

Magnetic door switch for pedestrian door shall be a 2-section, self-lock mounting type switch, and shall be compatible with the material of the door on which it is installed. The switch shall be epoxied in the switch housing. Magnetic contact switches shall be the type capable of being concealed on the top of the door frame.

Magnetic contact switches for the overhead vehicle doors shall be 2-section, extra heavy-duty, floor mounting type switch with stainless steel armored cable.

Switch shall be housed in a non-magnetic case.

Glass break discriminator.--

Glass break discriminator shall be an acoustic glass break detector with advanced technology for sensing and reporting simultaneous sound and shock wave activity. Detector shall respond to energy of breaking windows using piezo-electric crystal microphone. Sensor coverage pattern shall be directional, detecting breakage of uncovered glass in a 10.5 meters wide area at a distance of 3.5 meters minimum. The sensor shall be housed in a fire retardant ABS housing.

Digital keypad.--

Keypad shall be 12 button keypad with 16 user codes capable of expansion to 120, surface mounted, low-voltage (12VDC/24VDC), vandal resistant device with programmable ability for user codes 1-6 digits. Keypad will have an EEPROM memory for backup of all codes, have a relock time delay adjustable time from 1-90 seconds or on/off and have a tamper switch to detect unauthorized access to the keypad working mechanism. The keypad will have incorporated four (4) on-board relays for electric door locks, alarm shunting, forced door monitoring and door ajar monitoring.

Keyed Lever Lock.—

Shall be heavy-duty cylindrical lock set, steel, brass alloy construction, 121mm long; Rose 89mm dis ; projection 62mm. Storeroom lock set – lock operated by key or inside knob. Outer knob always rigid, inside knob always free.

PART 3. EXECUTION.--**INSTALLATION.--**

General.--The intrusion alarm reporting system shall be installed in accordance with the manufacturer's recommendations and at the locations specified on the floor plans.

The switch section without wires shall be recessed flush into the top edge of the door at the approximate center of the door, and the switch section with wires shall be recessed flush in the top section of the door frame. The two sections of the switch shall be mounted directly opposite each other to provide maximum sensitivity. The wiring from each magnetic switch shall be run to the control panel in the zone dedicated for the intrusion alarm circuit.

The magnetic contact switch for overhead door shall be without wires. The switch section with wire shall be mounted on the floor directly below the switch part without wires. The wiring from each magnetic contact switch shall run to the control panel in the zone dedicated for the intrusion alarm circuit.

The glass break discriminator shall be mounted on the ceiling at locations shown on the plans.

Intrusion alarm zoning.--Intrusion alarm reporting panel zoning shall be as follows (Intrusion Alarm Control Panel (item #1) in Communication Room:

Zone 1: Pedestrian access door into Shop area Room 101 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #2); one (1) Magnetic Contact Switch-Pedestrian (item #3) and one (1) Magnetic Contact Switch-Vehicle (item #4).

Zone 2: Pedestrian access door into Shop area Room 102 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #5); one (1) Magnetic Contact Switch-Pedestrian (item #6) and one (1) Magnetic Contact Switch-Vehicle (item #7).

Zone 3: Pedestrian access door into Shop area Room 103 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #8); one (1) Magnetic Contact Switch-Pedestrian (item #9) and one (1) Magnetic Contact Switch-Vehicle (item #10).

Zone 4: Pedestrian access door into Shop area Room 104 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #11); one (1) Magnetic Contact Switch-Pedestrian (item #12) and one (1) Magnetic Contact Switch-Vehicle (item #13).

Zone 5: Pedestrian access door into Shop area Room 105 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #14); one (1) Magnetic Contact Switch-Pedestrian (item #15) and one (1) Magnetic Contact Switch-Vehicle (item #16).

Zone 6: Pedestrian access door into Shop area Room 106 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #17); one (1) Magnetic Contact Switch-Pedestrian (item #18) and one (1) Magnetic Contact Switch-Vehicle (item #19).

Zone 7: Pedestrian access door into Shop area Room 107 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #22); one (1) Magnetic Contact Switch-Pedestrian (item #23) and one (1) Magnetic Contact Switch-Vehicle (item #24).

Zone 8: Pedestrian access door into North Corridor area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #20 and one (1) Magnetic Contact Switch-Pedestrian (item #21).

Zone 9: Pedestrian access door into Shop area Room 108 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #25); one (1) Magnetic Contact Switch-Pedestrian (item #26) and one (1) Magnetic Contact Switch-Vehicle (item #27).

Zone 10: Pedestrian access door into Shop area Room 109 to include: one (1) Digital Keypad (30 Second Delay Entry)(item #28); one (1) Magnetic Contact Switch-Pedestrian (item #29) and one (1) Magnetic Contact Switch-Vehicle (item #30).

Zone 11: Pedestrian access door into west Corridor area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #31) and one (1) Magnetic Contact Switch-Pedestrian (item #32).

Zone 12: Pedestrian access door into east Corridor area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #43) and one (1) Magnetic Contact Switch-Pedestrian (item #44).

Zone 13: Pedestrian access door into Break Room area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #33) and one (1) Magnetic Contact Switch-Pedestrian (item #34).

Zone 14: Pedestrian access door into Lobby area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #40) and one (1) Magnetic Contact Switch-Pedestrian (item #41).

Zone 15: Glass Break Detector in Lobby area (item #42).

Zone 16: Glass Break Detector in Break Room (item #35).

Zone 17: Glass Break Detectors in Offices areas Rooms #222, #221, #220 and #219 (items #36, #37, #38 and #39).

Zone 18: Glass Break Detectors in Offices areas Rooms #201, #202, #203, #204 and #205 (items #46, #47, #48, #49 and #50).

Zone 19: Glass Break Detector at east Corridor Pedestrian access (item #45).

Zone 20: Pedestrian access door into north Service Bay area to include: one (1) Digital Keypad (30 Second Delay entry)(item #59) and one (1) Magnetic Contact Switch-Pedestrian (item #58).

Zone 21: Vehicle access door into east Service Bay area to include: one (1) Magnetic Contact Switch-Vehicle (item #57).

Zone 22: Pedestrian access door into Work area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #56) and one (1) Magnetic Contact Switch-Pedestrian (item #55).

Zone 23: Vehicle access door into Work area to include: one (1) Magnetic Contact Switch-Vehicle (item #68).

Zone 24: Vehicle access doors into East Equipment Bay areas the include: three (3) Magnetic Contact Switches-Vehicle (items #52, #53 and #54).

Zone 25: Pedestrian access door into southeast Equipment Bay area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #50) and one (1) Magnetic Contact Switch-Pedestrian (item #51).

Zone 26: Pedestrian and Vehicle access doors into northwest side into Service Bay area to include: one (1) Magnetic Contact Switch-Pedestrian (item #60) and one (1) Magnetic Contact Switch-Vehicle (item #61).

Zone 27: Pedestrian access door into northwest Equipment Bay area to include: one (1) Digital Keypad (30 Second Delay Entry)(item #62) and one (1) Magnetic Contact Switch-Pedestrian (item #63).

Zone 28: Vehicle access door into Equipment Bay area to include: four (4) Magnetic Contact Switches-Vehicle (items #64, #65, #66 AND #67).

Conduit and conductors.--All intrusion alarm system wiring shall be installed in conduit system conforming to the requirements under "Basic Materials and Methods" elsewhere in these special provisions. Conduit size shall be as recommended by the intrusion alarm manufacturer, except that conduits shall be not less than 16 mm diameter. Within the office building areas, conduits shall be concealed in ceiling or walls. All conductors and cables for the intrusion alarm system wiring shall be as recommended by the intrusion alarm system manufacturer.

All points of protection must be specifically identified by zone when reporting to the intrusion alarm panel. All points of protection will be transmitted to the U.L. listed monitoring company.

FIELD QUALITY CONTROL.--

Testing.--The operational test for the intrusion alarm system shall be performed by the Contractor in the presence of the Engineer. The operational tests shall demonstrate that all functions of the system operate in the manner described in the manufacturer's literature and demonstrate system stability under normal vibration and shocks to components. The Contractor shall notify the Engineer in writing not less than 10 days in advance of performing the operational tests.

Monitoring.-- The Contractor shall provide U.L. Listed monitoring services for the facility for one year after the acceptance of the contract. The services shall include a toll-free telephone line connecting to the 24-hour on call monitoring station. Monitoring station shall contact designated site representative in the event of alarm and dispatch an immediate on-site response to the alarm location if the site representative cannot be reached or verification of the cause of the alarm cannot be determined.

DEMONSTRATION.—

Training.--The Contractor shall provide on-site training on the use, operation, and maintenance of the system for not more than 8 designated State employees. The Contractor shall notify the Engineer in writing not less than 10 days in advance of proposed training class.